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Brundage et al.

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(45) **Date of Patent: Jan. 7, 2014**

(54) **BLANKS AND METHODS FOR FORMING REINFORCED CONTAINERS**

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(21) Appl. No.: **12/709,209**

(22) Filed: **Feb. 19, 2010**

(65) **Prior Publication Data**

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(51) **Int. Cl.**

B65D 5/10	(2006.01)
B31B 1/26	(2006.01)
B31B 1/50	(2006.01)

(52) **U.S. Cl.**
USPC **229/157**; 229/160; 229/170; 229/174

(58) **Field of Classification Search**
USPC 229/156, 157, 160, 170, 172, 174, 185, 229/918, 919, 117.13, 117.14; 493/121, 493/137, 139, 140, 162
See application file for complete search history.

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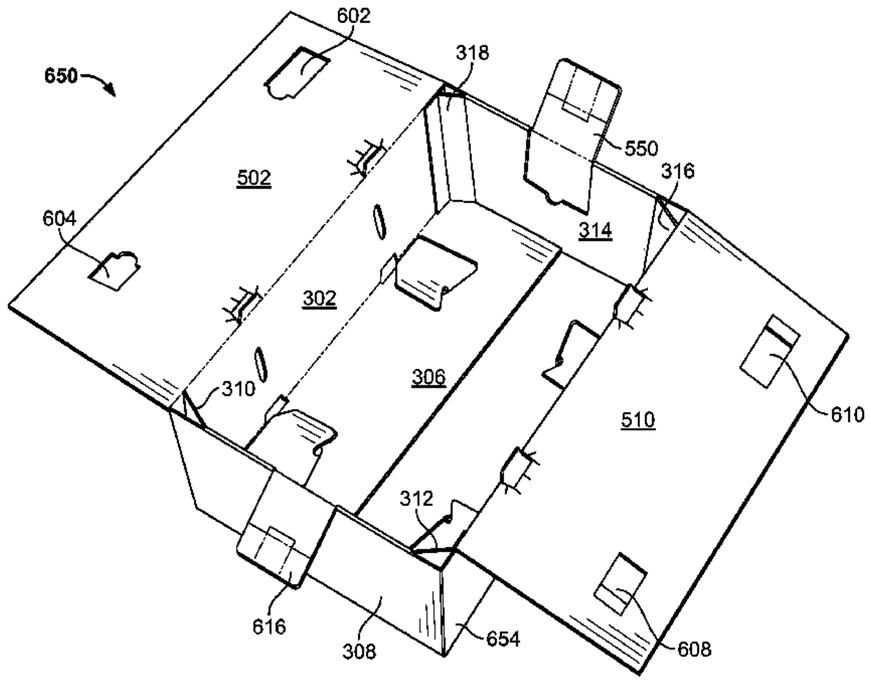
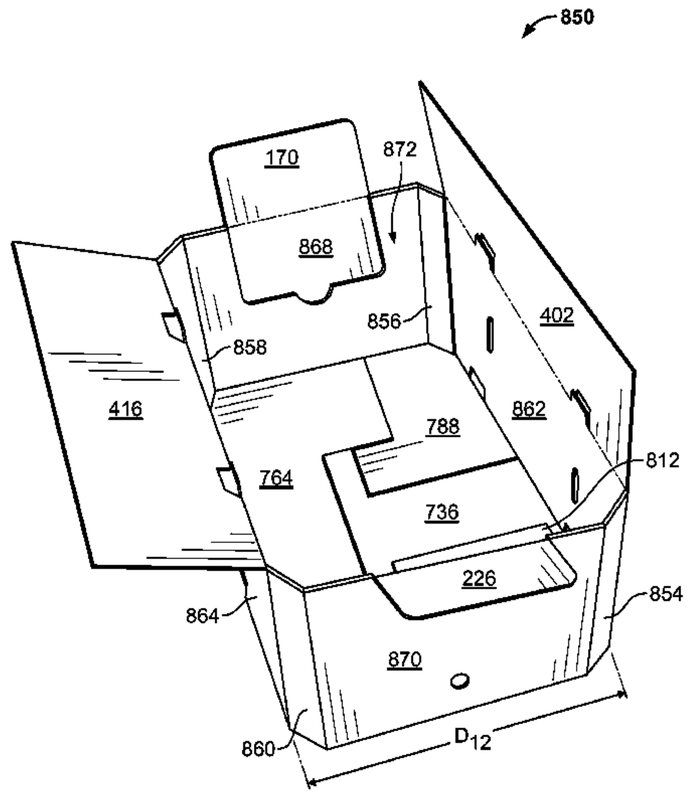
Primary Examiner — Gary Elkins
(74) *Attorney, Agent, or Firm* — Armstrong Teasdale LLP

(57) **ABSTRACT**

A blank of sheet material for forming a container is provided. The blank includes a first reinforcing end panel extending from a first end panel, a first corner post panel extending from a first edge of the first reinforcing end panel, and a first top end panel defined within the first reinforcing end panel.

24 Claims, 17 Drawing Sheets





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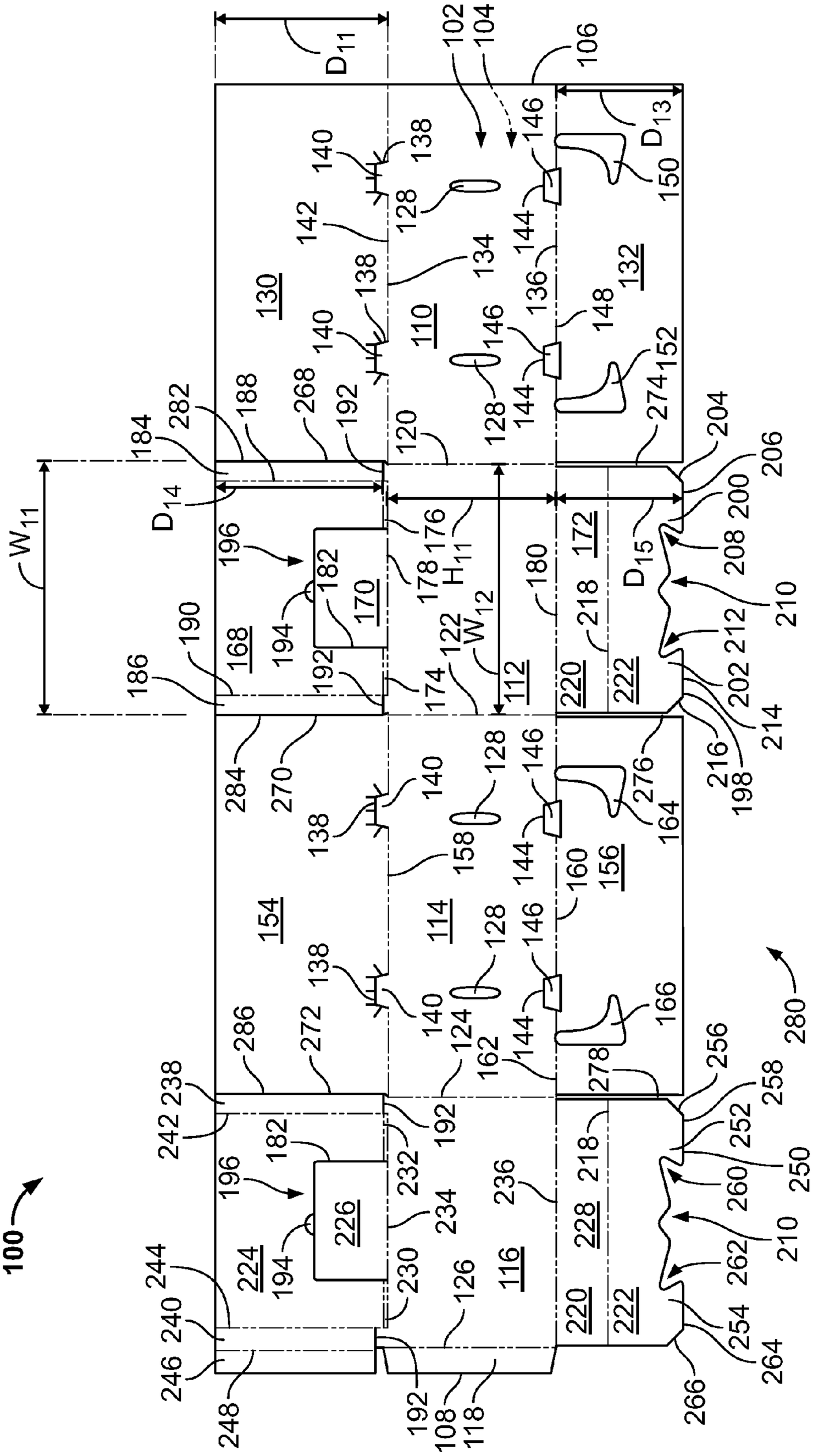
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FIG. 1

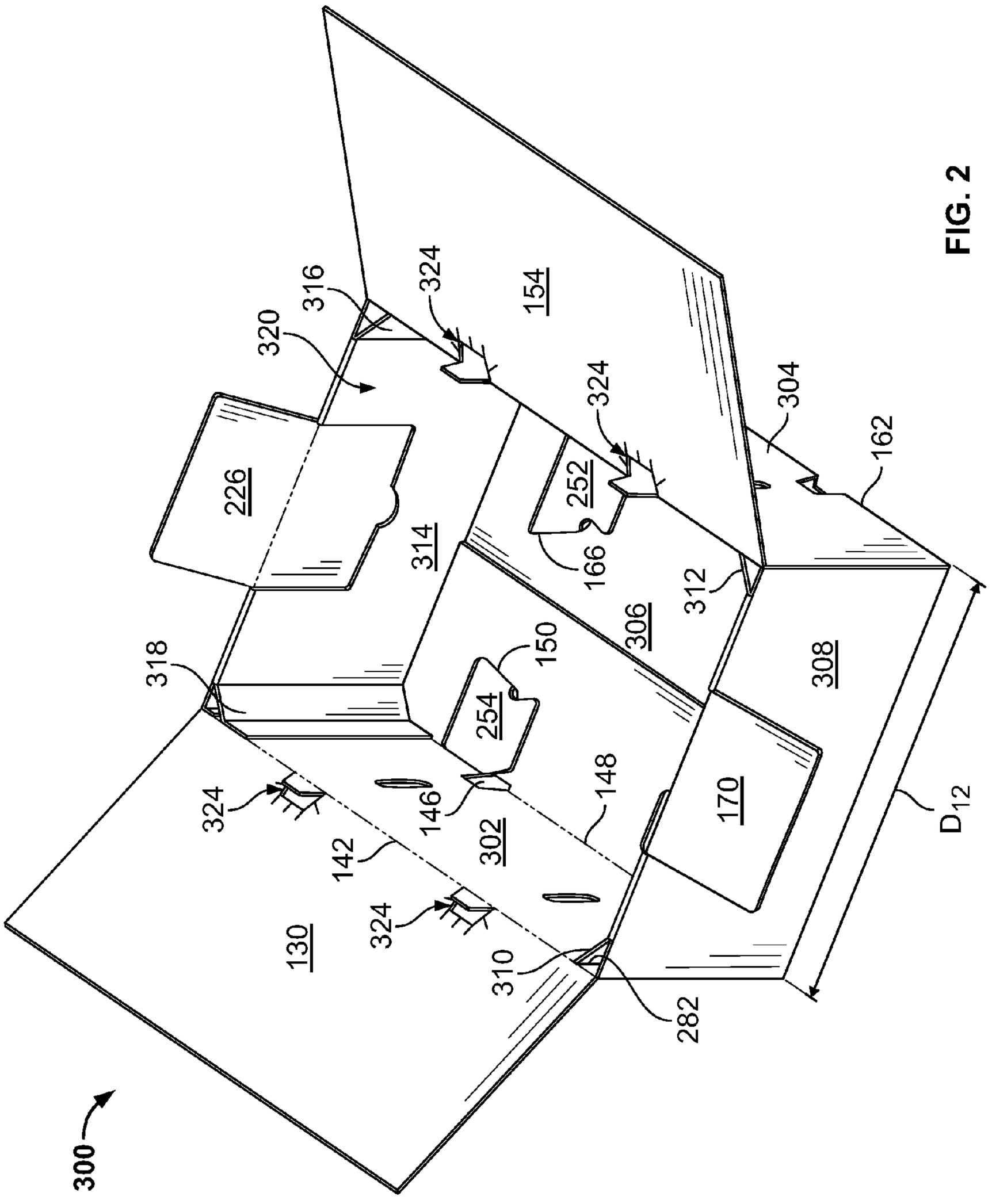
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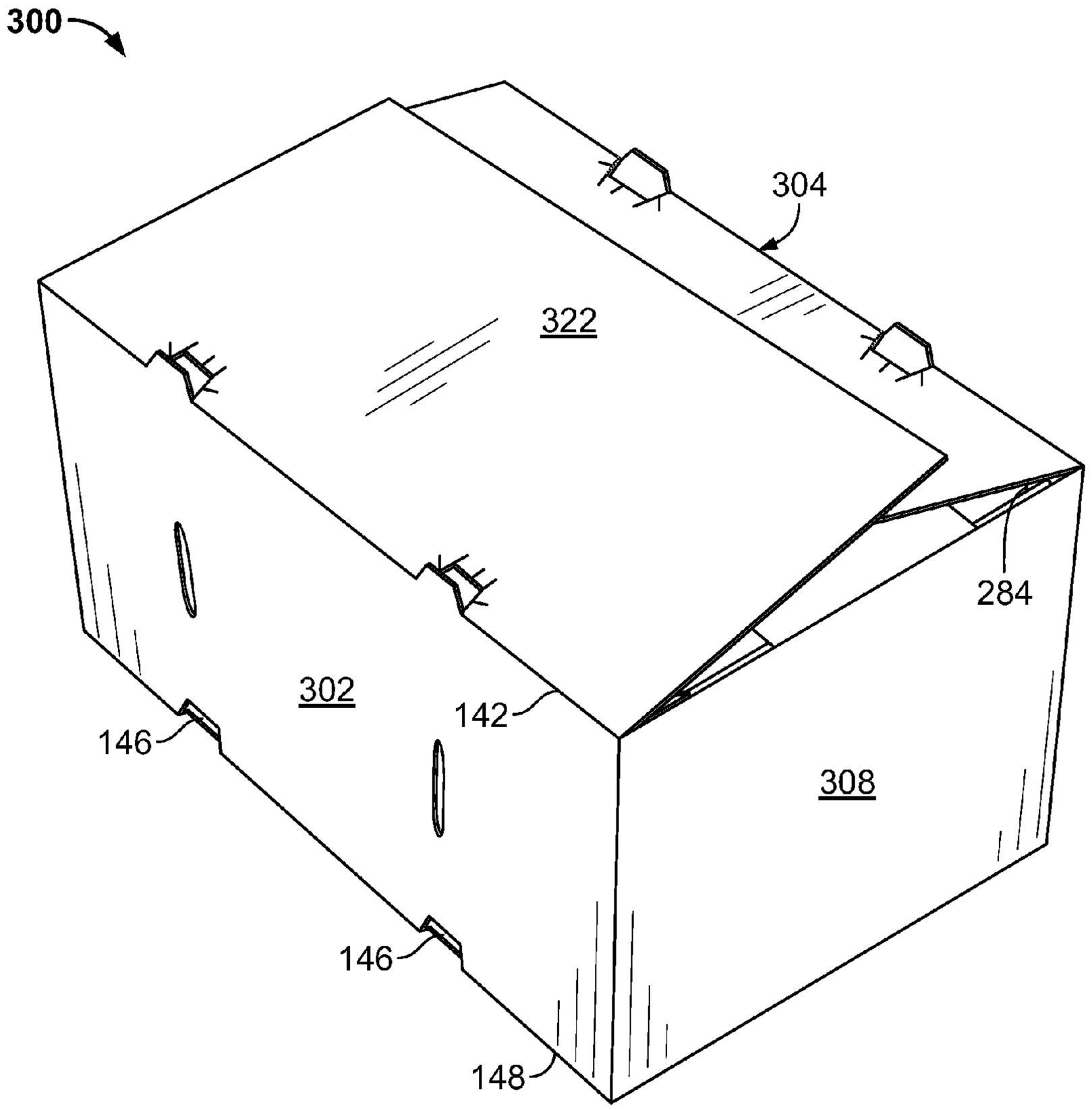
FIG. 2



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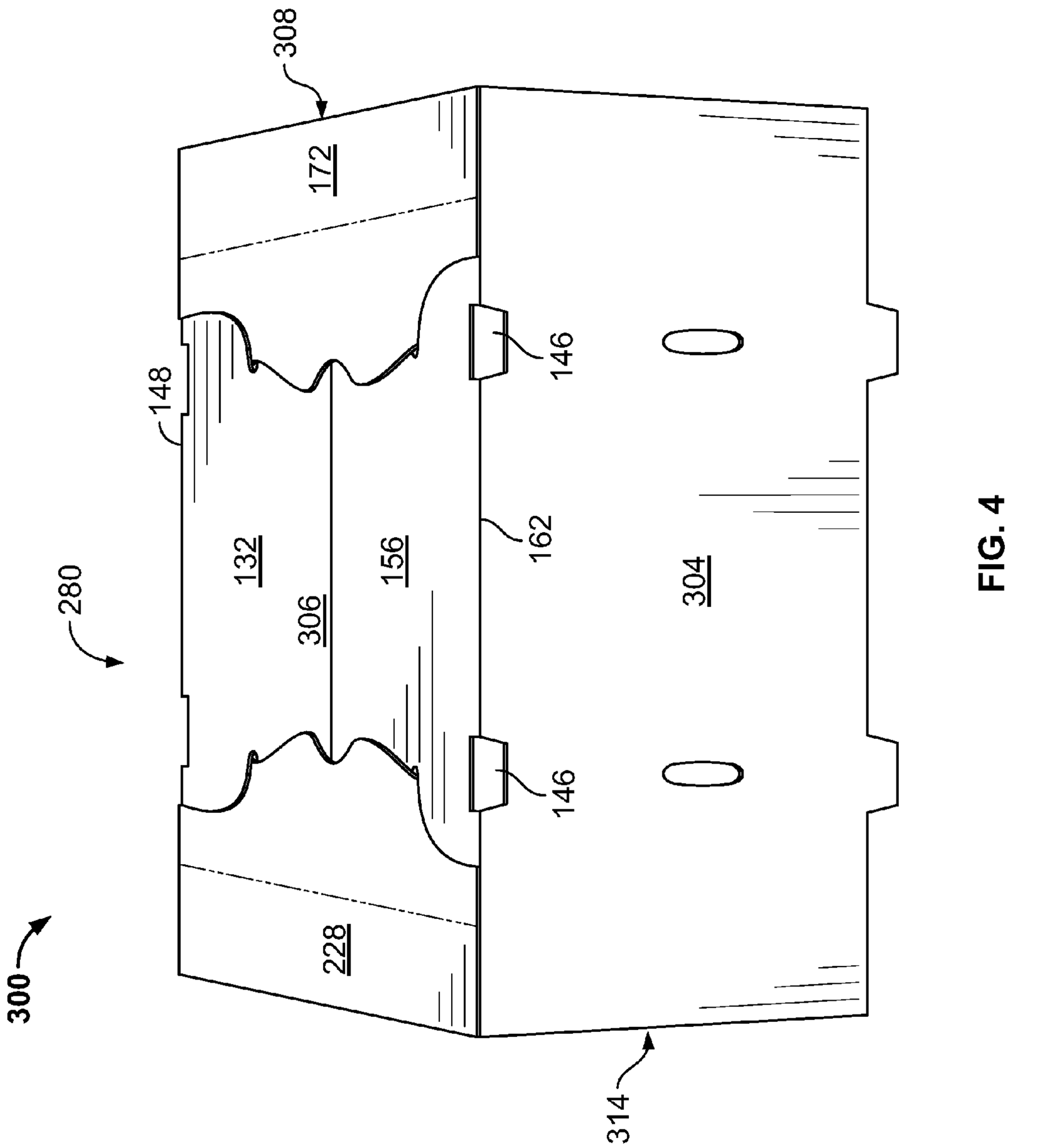

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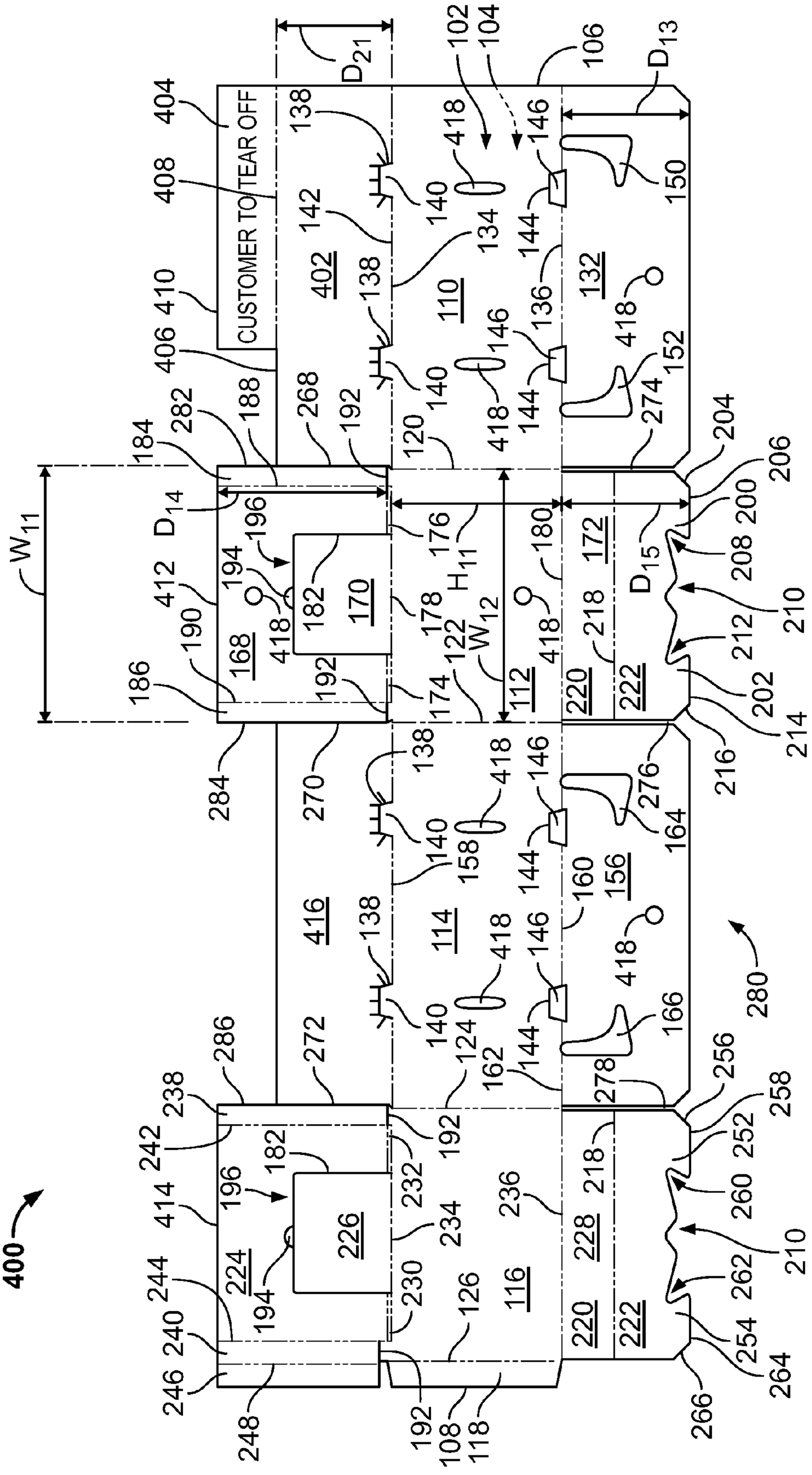
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FIG. 5

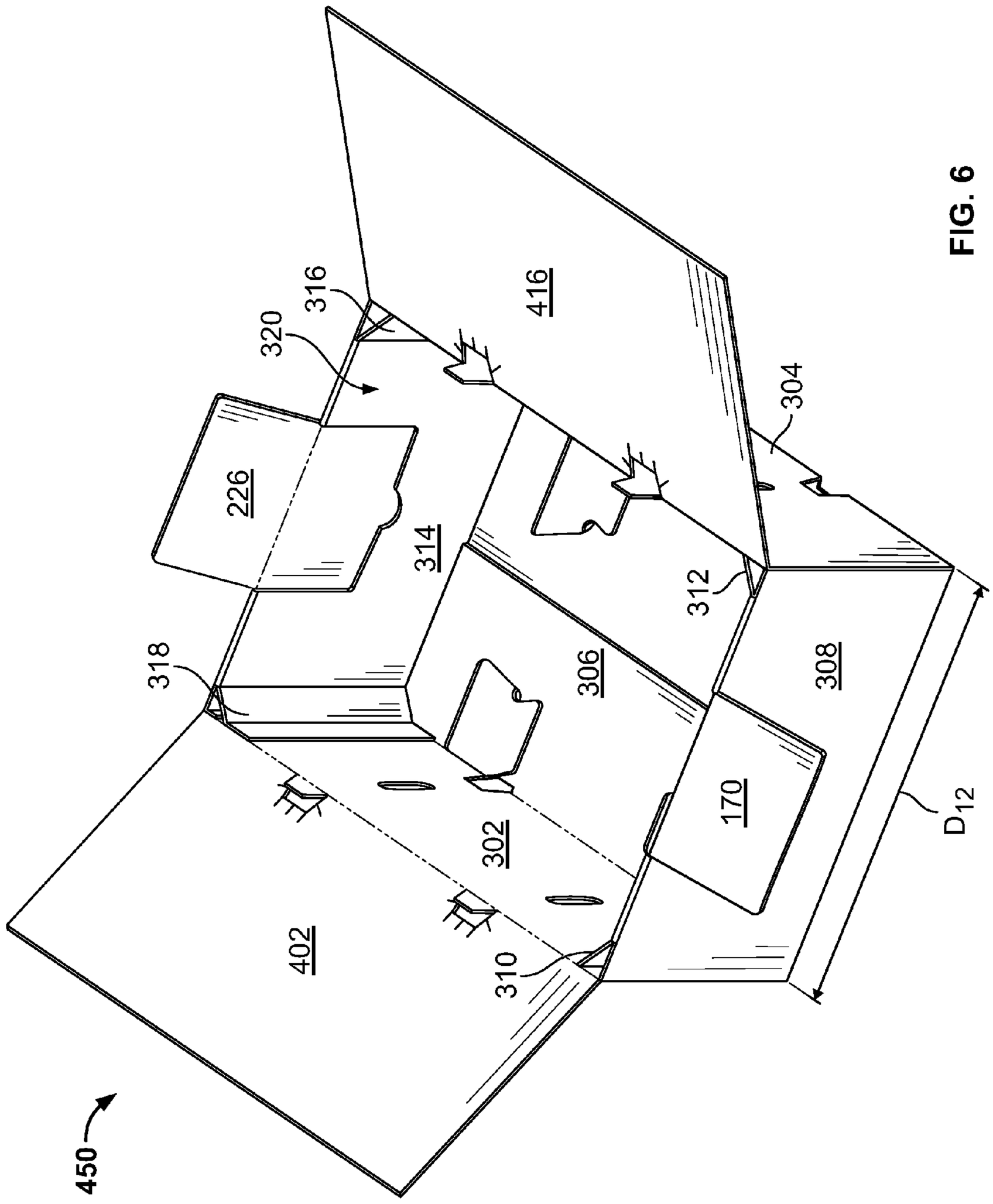

FIG. 6

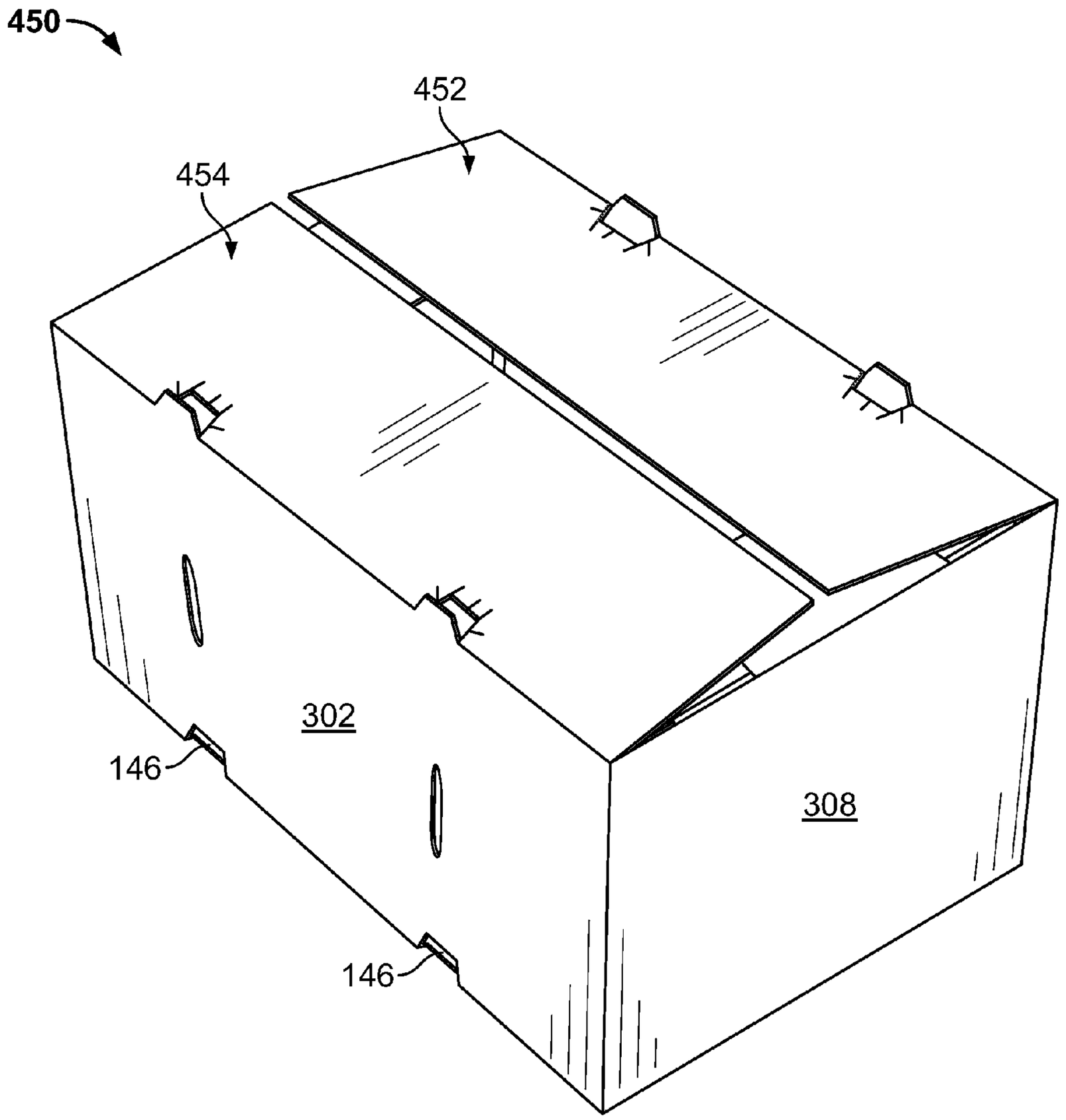

FIG. 7

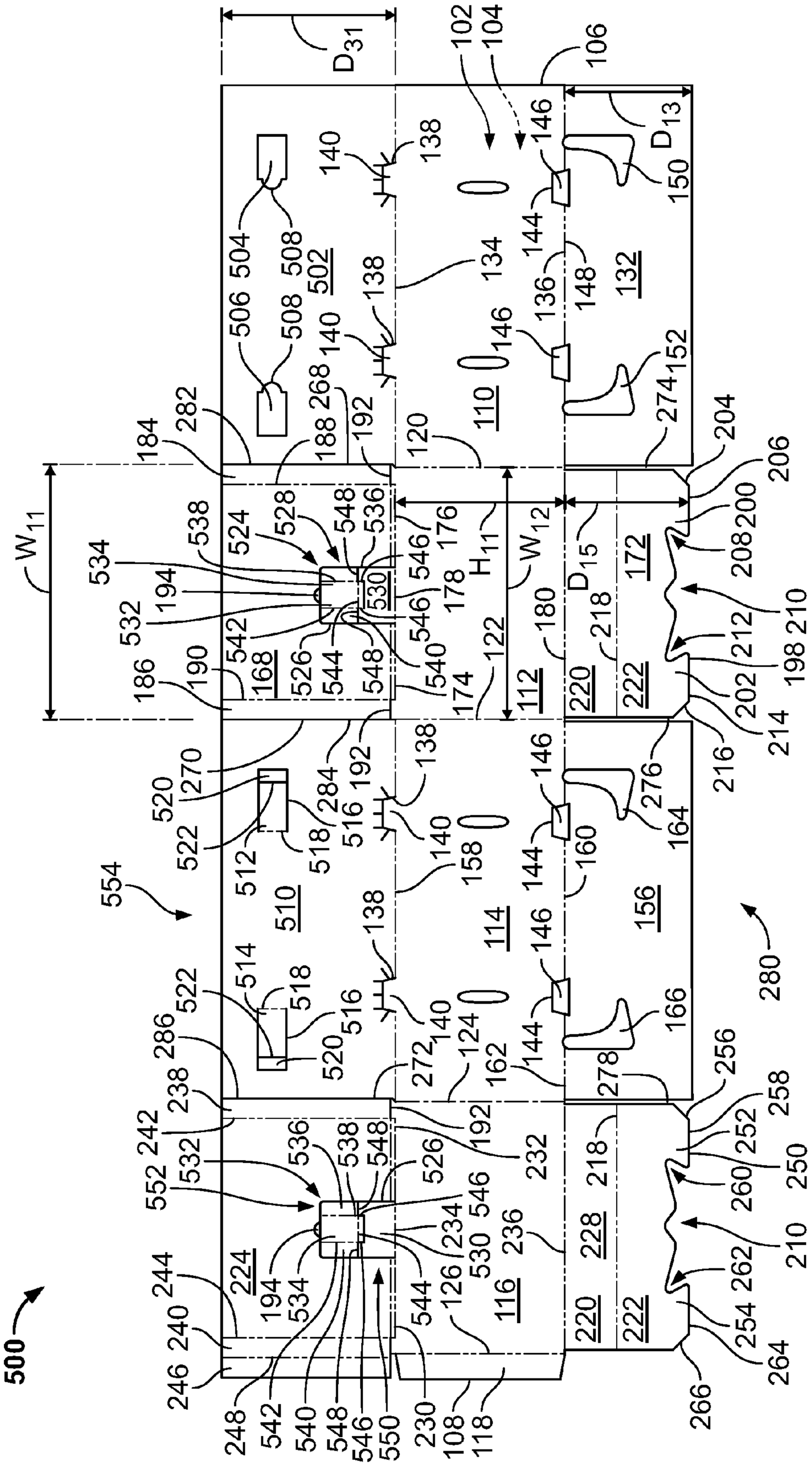
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FIG. 8

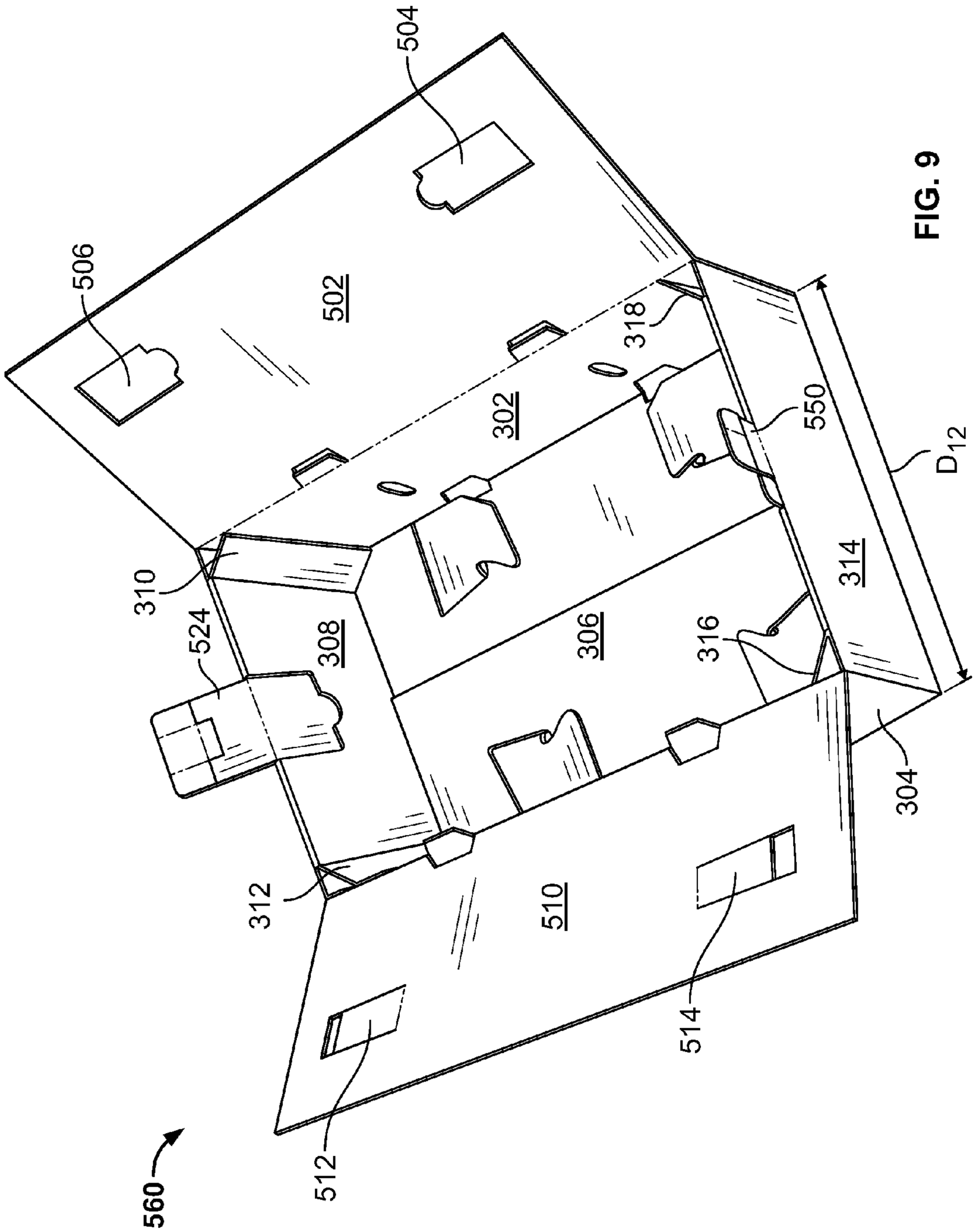
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FIG. 9

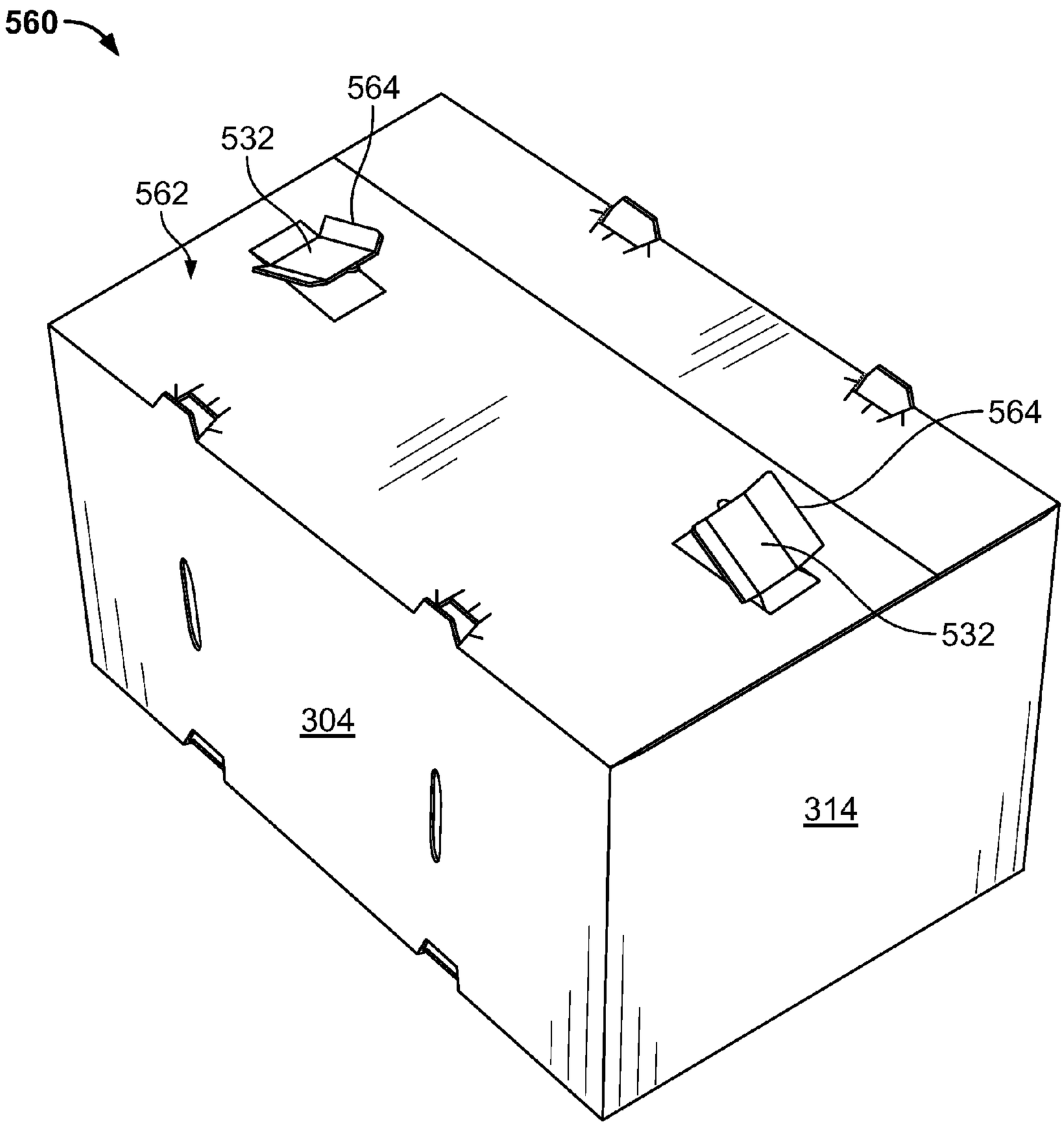

FIG. 10

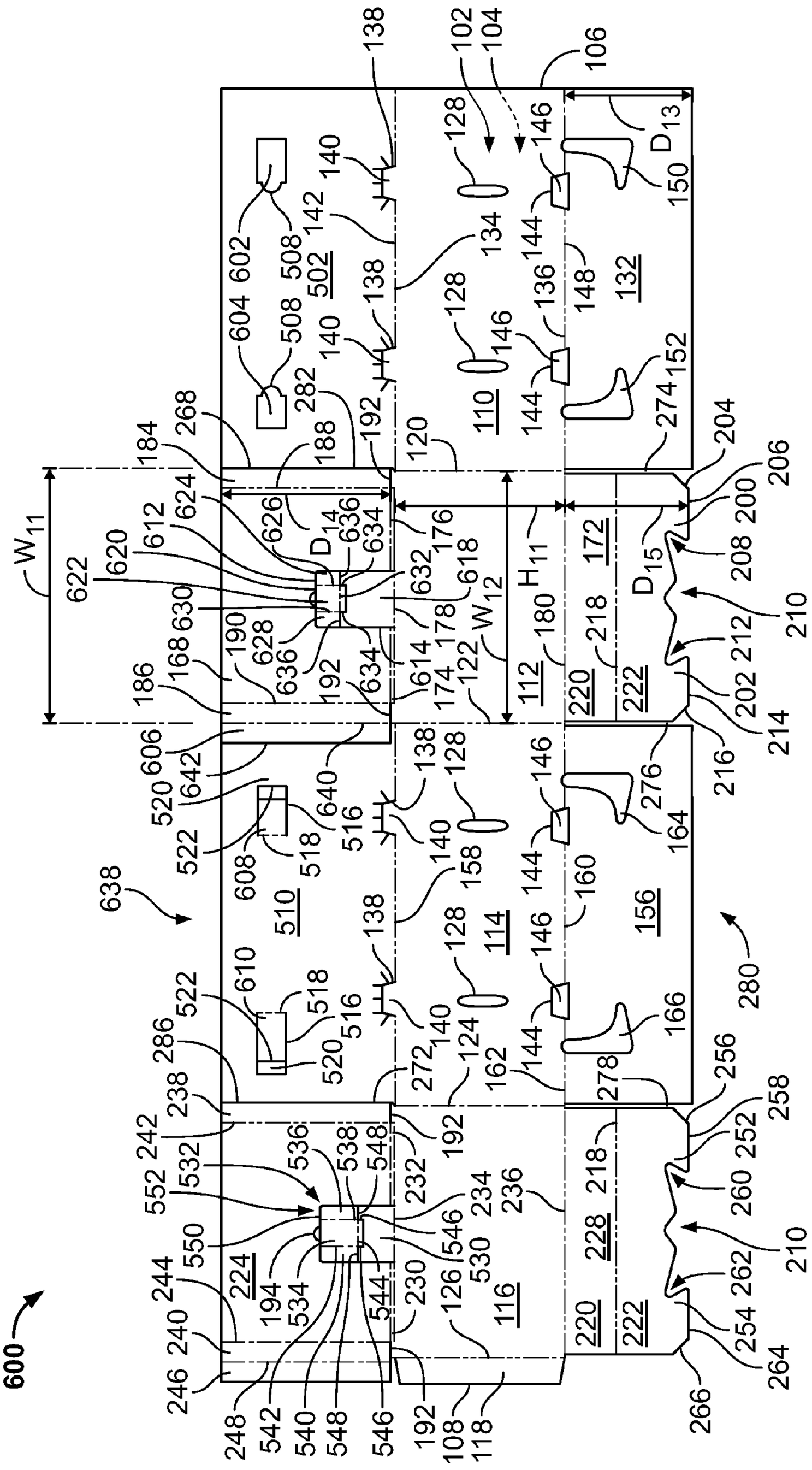
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FIG. 11

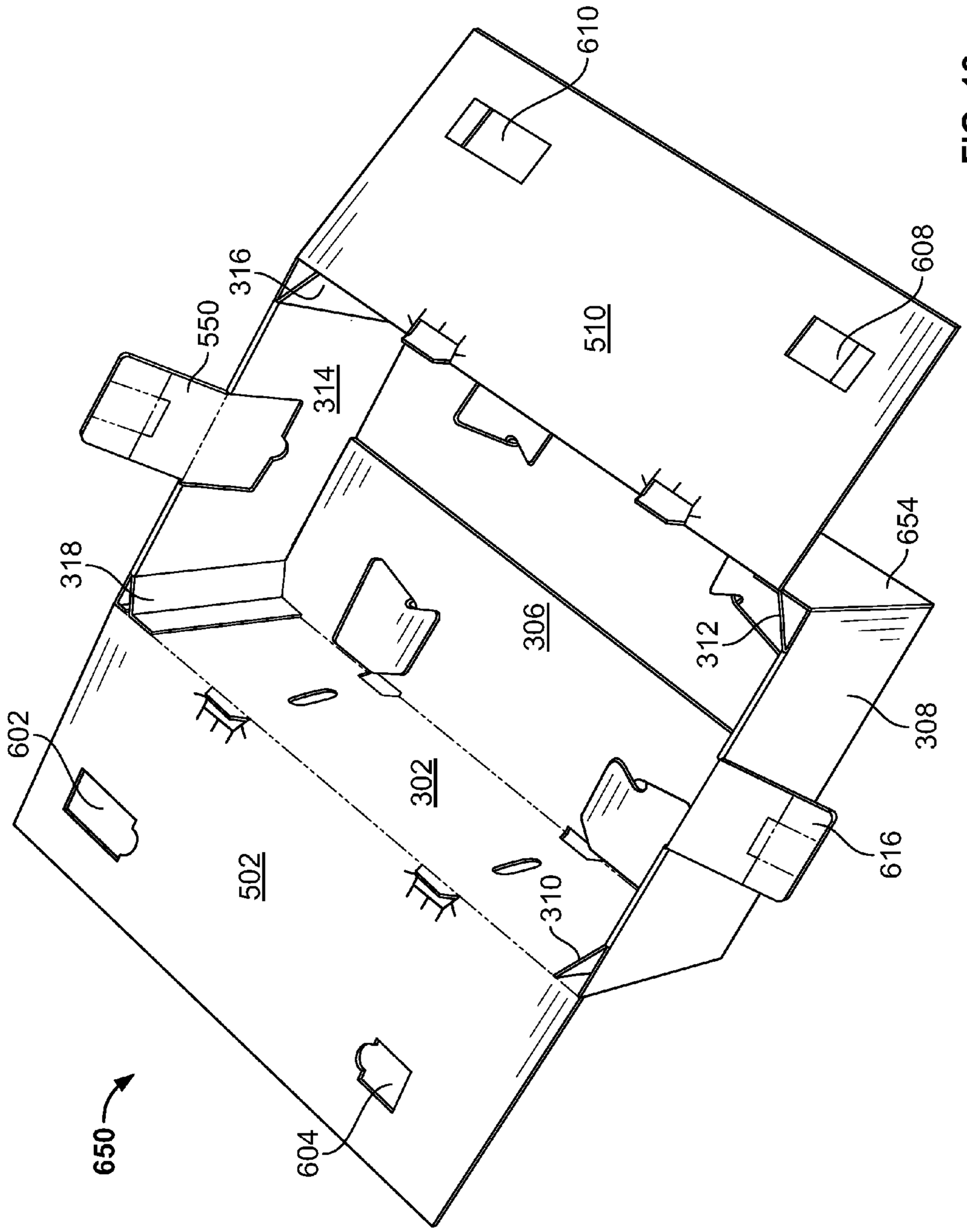
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FIG. 12

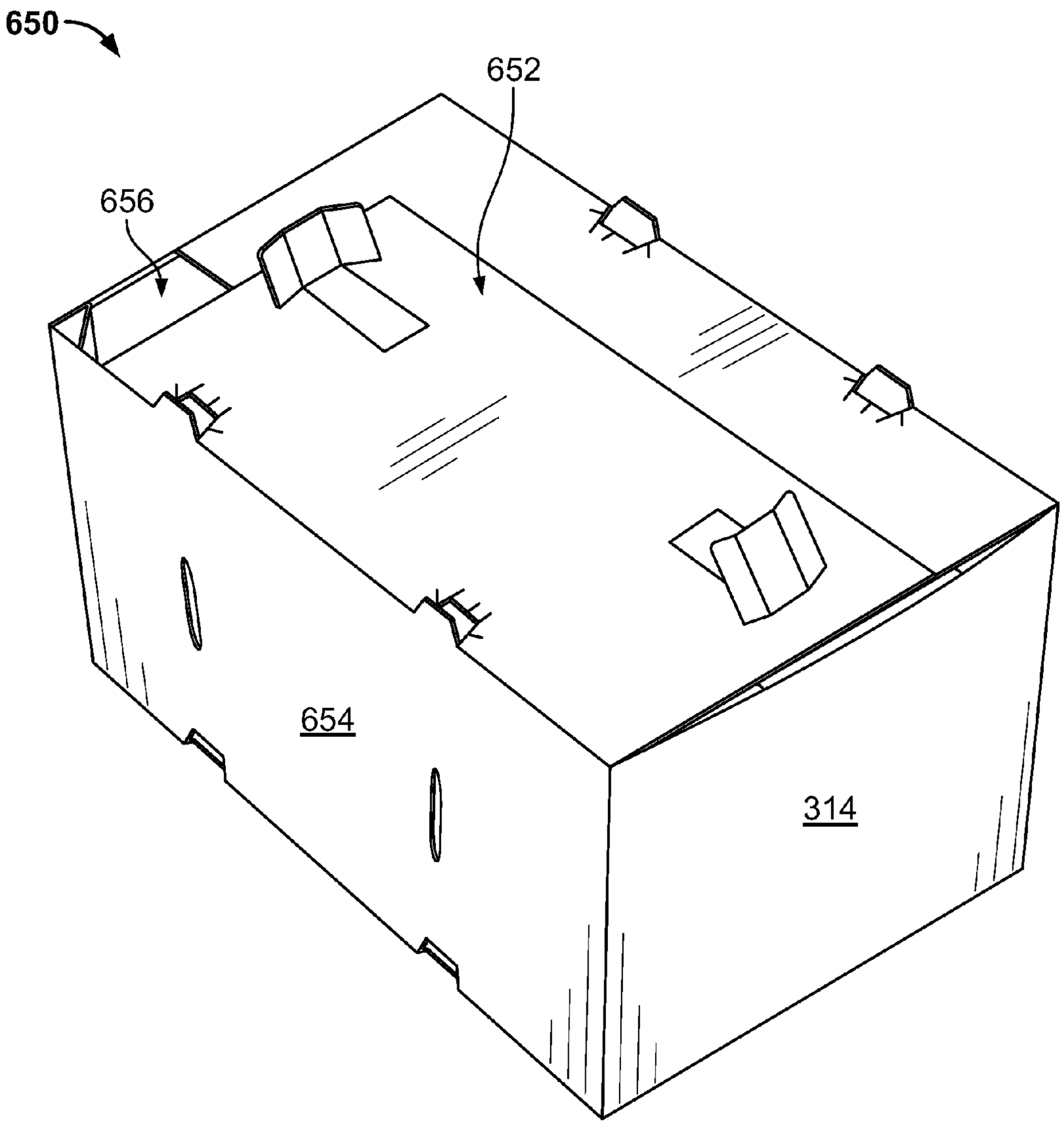

FIG. 13

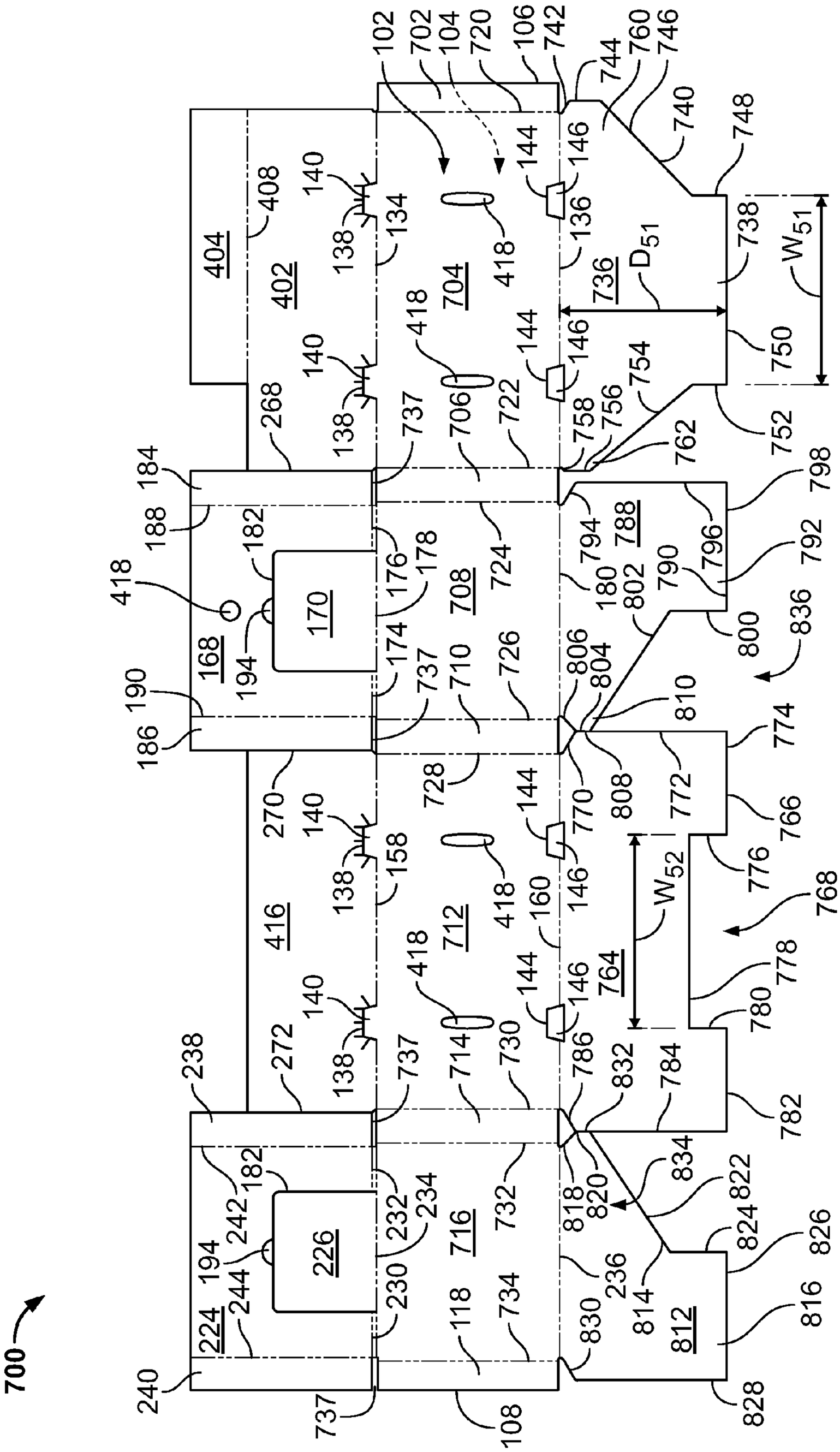
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FIG. 14

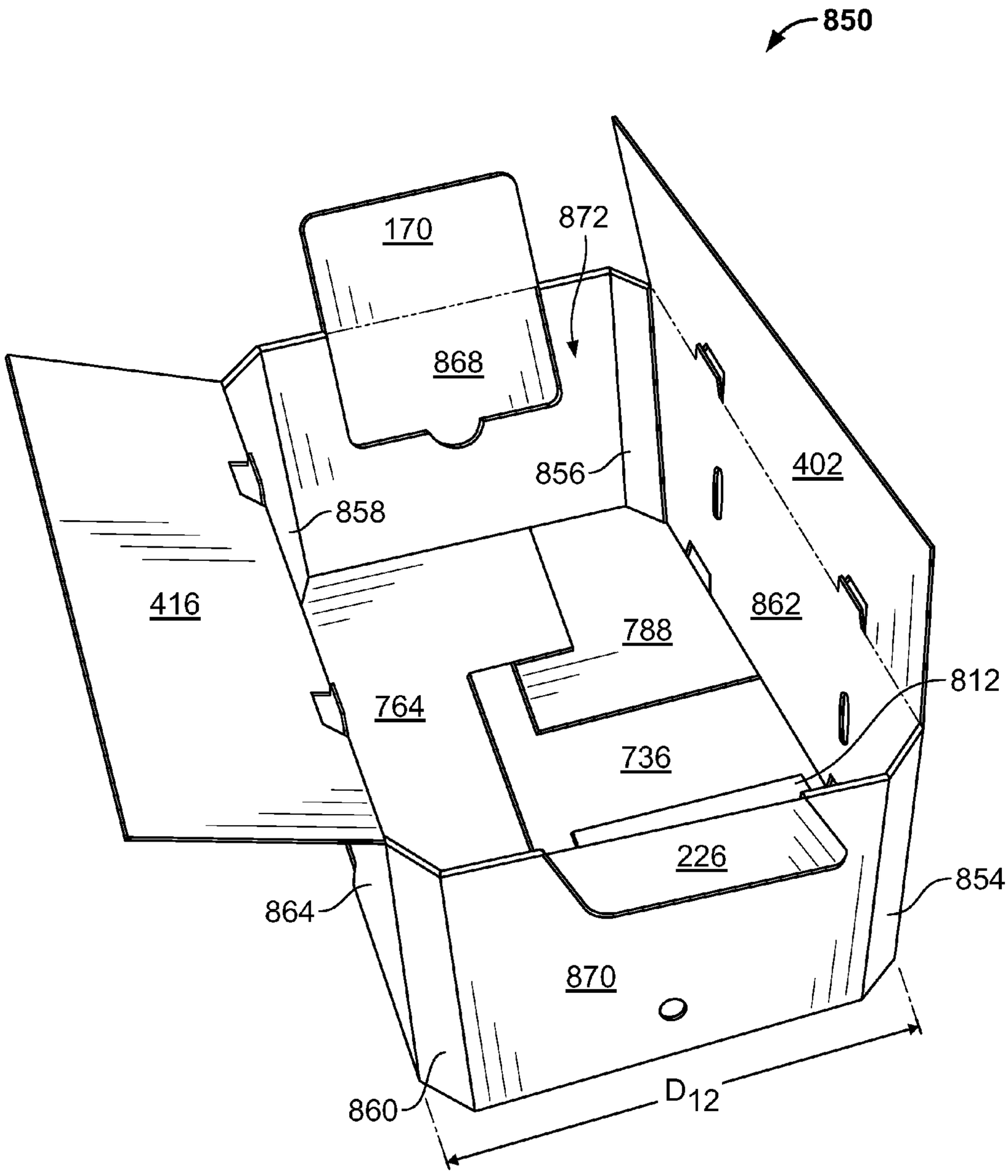
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FIG. 15

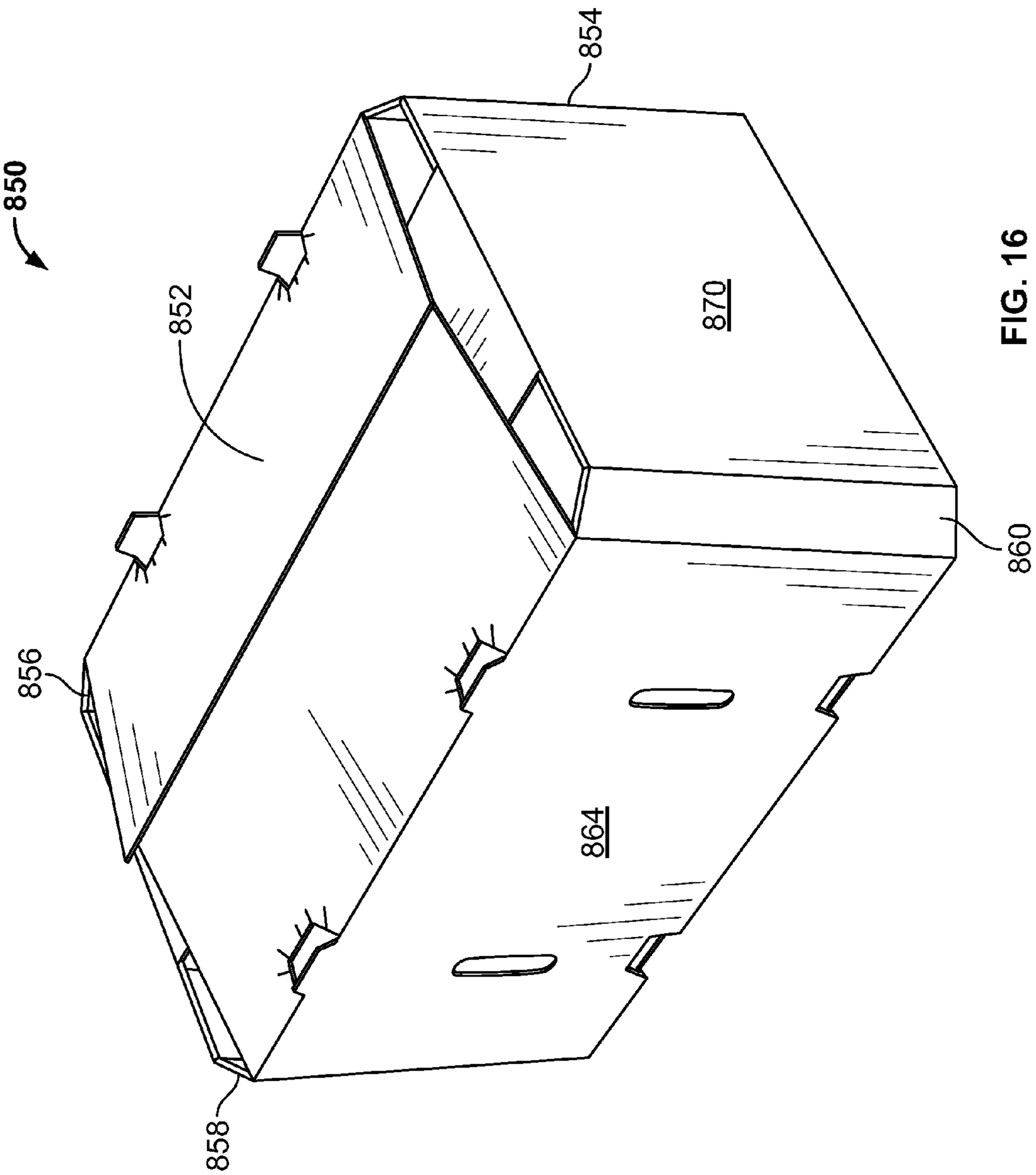

FIG. 16

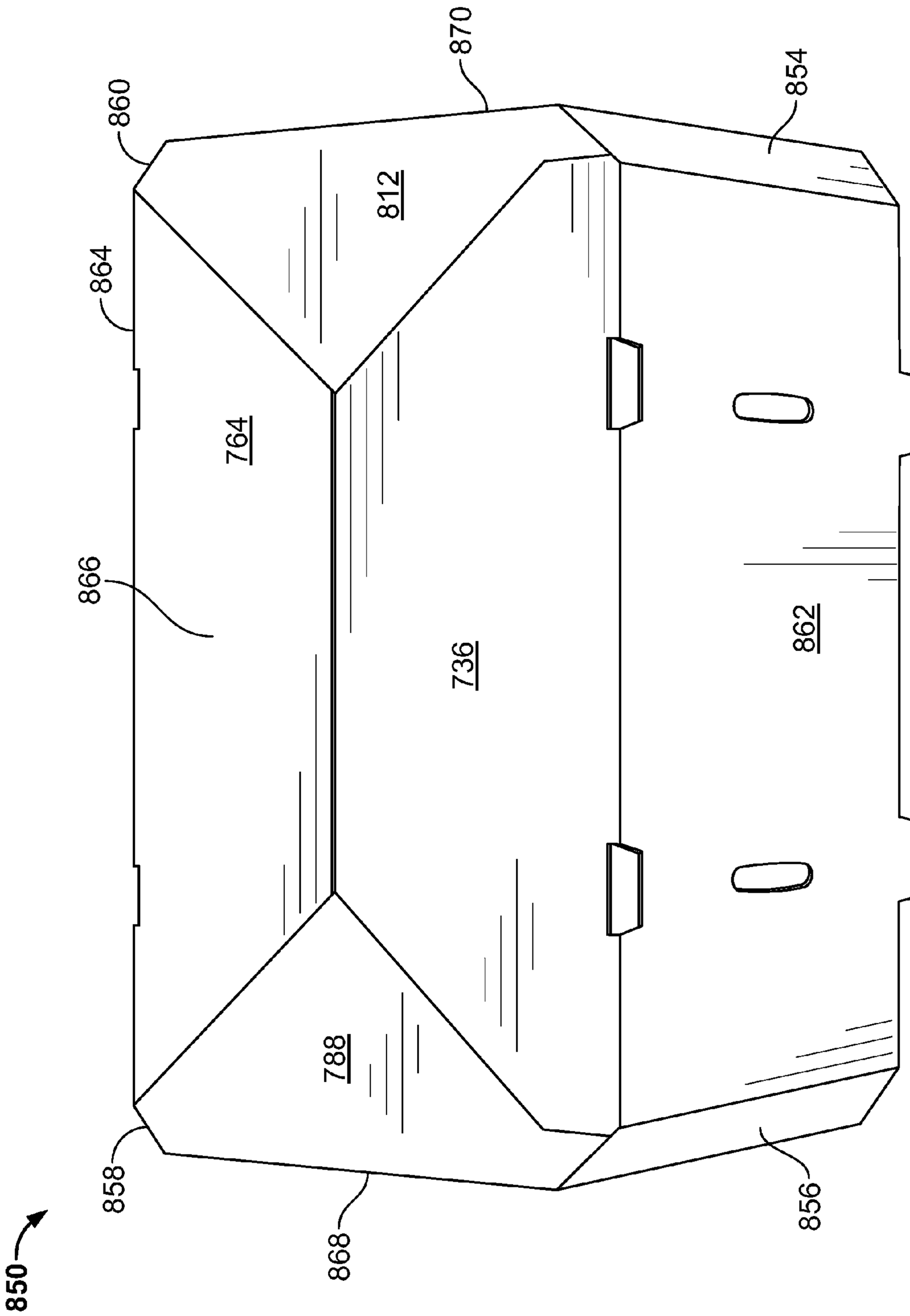

FIG. 17

BLANKS AND METHODS FOR FORMING REINFORCED CONTAINERS

BACKGROUND OF THE INVENTION

The embodiments described herein relate generally to a single blank for forming a reinforced container and, more particularly, to a single blank for forming a reinforced container having corner posts.

At least some known containers that are used to transport and/or store products may be stacked one on the other when the products are being transported or stored. This layering of containers may sometime cause the containers on the lower layers may be deformed by compression forces applied thereto by the upper layers of containers. When a container deforms or crushes, products within the container may then be required to support the weight of the upper layers. As such, the products within the containers may be damaged during transport and/or storage. At least the containers on the lower layers can be reinforced to facilitate supporting the weight of the upper layers without the products in the lower layers of containers being damaged.

At least one known reinforced container is formed from multiple blanks of sheet material. More specifically, an un-reinforced container is formed from one blank, and additional end inserts are formed from the other blanks. The end inserts are then positioned within the un-reinforced container to reinforce at least the end panels of the un-reinforced container. Such reinforced containers are more costly than un-reinforced containers because of the additional blanks needed to form the inserts. Further, the multiple blanks require additional time to form the reinforced container. Moreover, keeping track of the different blanks can cause additional problems when trying to assemble a reinforced container and all of the needed blanks cannot be located. Accordingly, there is a need for a simpler blank for forming a reinforced container.

BRIEF DESCRIPTION OF THE INVENTION

In one aspect, a blank of sheet material for forming a container is provided. The blank includes a first reinforcing end panel extending from a first end panel, a first corner post panel extending from a first edge of the first reinforcing end panel, and a first top end panel defined within the first reinforcing end panel.

In another aspect, a container formed from a blank of sheet material is provided. The container includes a first end wall formed from a first end panel and an interconnected first reinforcing end panel positioned in face-to-face relationship with the first end panel, a first top end panel extending from the first end panel, and a bottom wall oriented substantially perpendicularly to the first end wall. The bottom wall includes a plurality of bottom panels interlocked together using a bottom locking mechanism.

In yet another aspect, a method for forming a container from a blank of sheet material is provided. The method includes rotating a plurality of panels about a plurality of fold lines to form at least a portion of a first side wall, an opposing second side wall, a first end wall, and an opposing second end wall. At least one end reinforcing panel is rotated with respect to the first end wall and/or the second end wall and a top end panel extending from the first end wall and/or the second wall to form a portion of the first end wall and/or the second end wall. The method further includes rotating at least one corner post panel with respect to the at least one reinforcing end panel to form at least one corner post within the container.

In still another aspect, a locking mechanism for use with a container formed from a blank of sheet material is provided. The blank includes a first top panel, a second top panel, a third top panel, and a fourth top panel. The locking mechanism includes at least one locking cutout defined in the first top panel, at least one locking flap defined by the second top panel, a minor cutout defined through the second top panel adjacent the at least one locking flap, and at least one locking tab defined by at least one of the third top panel and the fourth top panel. The at least one locking tab is configured to be inserted through the at least one locking cutout and the minor cutout and secured in position by the at least one locking flap.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1-17** show exemplary embodiments of the apparatus and methods described herein.

FIG. **1** is a top plan view of an exemplary blank of sheet material.

FIG. **2** is a top perspective view of a container formed from the blank shown in FIG. **1**.

FIG. **3** is a top perspective view of the container shown in FIG. **2** with a top wall formed.

FIG. **4** is a bottom perspective view of the container shown in FIG. **2**.

FIG. **5** is a top plan view of a first alternative blank of sheet material.

FIG. **6** is a top perspective view of a container formed from the blank shown in FIG. **5**.

FIG. **7** is a top perspective view of the container shown in FIG. **6** with a top wall formed.

FIG. **8** is a top plan view of a second alternative blank of sheet material.

FIG. **9** is a top perspective view of a container formed from the blank shown in FIG. **8**.

FIG. **10** is a top perspective view of the container shown in FIG. **9** with a top wall formed.

FIG. **11** is a top plan view of a third alternative blank of sheet material.

FIG. **12** is a top perspective view of a container formed from the blank shown in FIG. **11**.

FIG. **13** is a top perspective view of the container shown in FIG. **12** with a top wall formed.

FIG. **14** is a top plan view of a fourth alternative blank of sheet material.

FIG. **15** is a top perspective view of a container formed from the blank shown in FIG. **14**.

FIG. **16** is a top perspective view of the container shown in FIG. **15** with a top wall formed.

FIG. **17** is a bottom perspective view of the container shown in FIG. **15**.

DETAILED DESCRIPTION OF THE INVENTION

The following detailed description illustrates the disclosure by way of example and not by way of limitation. The description clearly enables one skilled in the art to make and use the disclosure, describes several embodiments, adaptations, variations, alternative, and use of the disclosure, including what is presently believed to be the best mode of carrying out the disclosure.

The present invention provides a container that includes integral corner posts, and a method for constructing the container. The container is constructed from a blank of sheet material using a machine and/or by hand. For example, the blank can be wrapped about a mandrel to form a knocked-down flat container, and the final construction of the container

can be performed by hand and/or by another machine. Alternatively, a folder/glue machine can be used to convey the blank through folder arms and adhesive applicator to form the knocked-down flat container. In one embodiment, the container is fabricated from a paperboard material. The container, however, may be fabricated using any suitable material, and therefore is not limited to a specific type of material. In alternative embodiments, the container is fabricated using cardboard, plastic, fiberboard, paperboard, foamboard, corrugated paper, and/or any suitable material known to those skilled in the art and guided by the teachings herein provided.

In the example embodiment, the container includes integrated corner posts. As such, the container can be formed from a single blank of sheet material. Accordingly, the containers described herein do not require separate inserts to form the corner posts. Further, the embodiments described herein include reinforced end walls that enable the container to be stacked. More specifically, the reinforced end walls and corner posts enable the containers described herein to be stronger than similar containers without reinforced end walls and/or corner posts, especially when subjected to vertical compression.

In an example embodiment, the container and/or a blank includes at least one marking thereon including, without limitation, indicia that communicates the product, a manufacturer of the product and/or a seller of the product. For example, the marking may include printed text that indicates a product's name and briefly describes the product, logos and/or trademarks that indicate a manufacturer and/or seller of the product, and/or designs and/or ornamentation that attract attention. In another embodiment, the container is void of markings, such as, without limitation, indicia that communicates the product, a manufacturer of the product and/or a seller of the product. Furthermore, the container may have any suitable size, shape and/or configuration, i.e., any suitable number of sides having any suitable size, shape and/or configuration as described and/or illustrated herein. In one embodiment, the container includes a shape that provides functionality, such as a shape that facilitates packaging a food item, a shape that facilitates transporting the container, and/or a shape that facilitates stacking and/or arrangement of a plurality of containers.

Further, different embodiments described here can vary in size and/or dimensions although similar labels are used for each embodiment. For example, although a depth is labeled similarly throughout the description, each embodiment can have varying depths.

Referring now to the drawings, and more specifically to FIGS. **1-4**, although as described above a container may have any suitable size, shape, and/or configuration, FIGS. **1-4** illustrate the construction or formation of one embodiment of a container. Specifically, FIG. **1** is a top plan view of an exemplary blank **100** of sheet material. FIG. **2** is a top perspective view of a container **300** formed from blank **100**. FIG. **3** is a top perspective view of container **300** with a top wall **322** formed. FIG. **4** is a bottom perspective view of container **300**.

Referring to FIG. **1**, blank **100** has a first or interior surface **102** and an opposing second or exterior surface **104**. Further, blank **100** defines a leading edge **106** and an opposing trailing edge **108**. In one embodiment, blank **100** includes, from leading edge **106** to trailing edge **108**, a first side panel **110**, a first end panel **112**, a second side panel **114**, a second end panel **116**, and a glue flap **118** coupled together along preformed, generally parallel, fold lines **120**, **122**, **124**, and **126**, respectively. More specifically, first side panel **110** extends from first end panel **112** along fold line **120**, second side panel **114** extends from first end panel **112** along fold line **122**, second end panel **116** extends from second side panel **114** along fold line **124**, and glue flap **118** extends from second end panel **116** along fold line **126**. Fold lines **120**, **122**, **124**, and/or **126**, as well as other fold lines and/or hinge lines described herein, may include any suitable line of weakening and/or line of separation known to those skilled in the art and guided by the teachings herein provided. In the exemplary embodiment, each side panel **110** and **114** includes elongated vent holes **128**. It should be understood that any panel and/or portion of blank **100** can include vent holes **128** having any suitable shape and/or configuration. In a particular embodiment, blank **100** does not include any vent holes **128**.

First side panel **110** includes a first top side panel **130** and a first bottom side panel **132** extending therefrom along respective fold lines **134** and **136**. More specifically, first top side panel **130** extends from first side panel **110** along fold line **134**, and first bottom side panel **132** extends from first side panel **110** along fold line **136**. In the exemplary embodiment, fold line **134** includes cut lines **138**. More specifically, cut lines **138** each define a tab portion **140**. When blank **100** is assembled to construct container **300** (shown in FIGS. **2-4**), tab portions **140** extend from a top edge **142** of first side panel **110** to define openings **324** (shown in FIG. **2**) extending through container **300**. Although cut lines **138** and tab portions **140** are shown and described as extending from fold line **134** and/or first side panel **110**, fold line **134** and/or first side panel **110** is not required to include cut lines **138** and tabs portions **140**. In the exemplary embodiment, fold line **136** includes cutouts **144** that define bottom vent holes **146** along a bottom edge **148** of first side panel **110** when container **300** is formed. Although cutouts **144** are shown and described as extending from fold line **136** and/or first side panel **110**, fold line **136** and/or first side panel **110** is not required to include cutouts **144**. In a particular embodiment, bottom vent holes **146** and tab portions **140** are configured such that, when containers **300** are stacked, tab portions **140** of a lower container **300** insert into bottom vent holes **146** of an upper container **300**.

In the exemplary embodiment, first top side panel **130** is substantially rectangular and has a depth D_{11} that is more than half of a depth D_{12} (shown in FIG. **2**) of container **300**. Alternatively, first top side panel **130** has any suitable depth that enables blank **100** and/or container **300** to function as described herein. First bottom side panel **132** is substantially rectangular and has a depth D_{13} that is about half of depth D_{12} of container **300**. Alternatively, first bottom side panel **132** has any suitable depth that enables blank **100** and/or container **300** to function as described herein. In the exemplary embodiment, first bottom side panel **132** includes a first locking slot **150** and a second locking slot **152**. Each locking slot **150** and **152** is generally L-shaped, and second locking slot **152** is a mirror-image of first locking slot **150**.

Similarly, second side panel **114** includes a second top side panel **154** and a second bottom side panel **156** extending therefrom along respective fold lines **158** and **160**. More specifically, second top side panel **154** extends from second side panel **114** along fold line **158**, and second bottom side panel **156** extends from second side panel **114** along fold line **160**. In the exemplary embodiment, fold line **158** includes cut lines **138**. More specifically, cut lines **138** each define tab portions **140**, as described above. Although cut lines **138** and tab portions **140** are shown and described as extending from fold line **158** and/or second side panel **114**, fold line **158** and/or second side panel **114** is not required to include cut lines **138** and tab portions **140**. In the exemplary embodiment, fold line **160** includes cutouts **144** that define bottom vent

holes **146**, as described above, along a bottom edge **162** of second side panel **114** when container **300** is formed. Although cutouts **144** are shown and described as extending from fold line **160** and/or second side panel **114**, fold line **160** and/or second side panel **114** is not required to include cutouts **144**.

In the exemplary embodiment, second top side panel **154** is substantially rectangular and has depth D_{11}. Alternatively, second top side panel **154** has any suitable depth, such as a depth other than depth D_{11}, that enables blank **100** and/or container **300** to function as described herein. Second bottom side panel **156** is substantially rectangular and has depth D_{13}. Alternatively, second bottom side panel **156** has any suitable depth, such as a depth other than depth D_{13}, that enables blank **100** and/or container **300** to function as described herein. In the exemplary embodiment, second bottom side panel **156** includes a third locking slot **164** and a fourth locking slot **166**. Each locking slot **164** and **166** is generally L-shaped, and fourth locking slot **166** is a mirror-image of third locking slot **164**.

First end panel **112** includes a first reinforcing end panel **168**, a first top end panel **170**, and a first bottom end panel **172** extending therefrom along respective fold lines **174**, **176**, **178**, and **180**. More specifically, first reinforcing end panel **168** extends from first end panel **112** along double fold lines **174** and **176**, first top end panel **170** extends from first end panel **112** along fold line **178**, and first bottom end panel **172** extends from first end panel **112** along fold line **180**. In the exemplary embodiment, first top end panel **170** is defined within first reinforcing end panel **168** by a cut line **182**. More specifically, cut line **182** defines a substantially rectangular and/or square shape of first top end panel **170**. Alternatively, first top end panel **170** can have any suitable shape that enables blank **100** and/or container **300** to function as described herein. In a particular embodiment, blank **100** does not include first top end panel **170**.

In the exemplary embodiment, first reinforcing end panel **168** is substantially rectangular and has a depth D_{14} that is approximately equal to a height H_{11} of first end panel **112**. In a particular embodiment, depth D_{14} and depth D_{11} are substantially equal. Alternatively, first reinforcing end panel **168** has any suitable depth that enables blank **100** and/or container **300** to function as described herein. In the exemplary embodiment, first reinforcing end panel **168** includes a first corner post panel **184** and a second corner post panel **186** extending therefrom along respective fold lines **188** and **190**. More specifically, first corner post panel **184** extends from first reinforcing end panel **168** along fold line **188**, and second corner post panel **186** extends from first reinforcing end panel **168** along fold line **190**. A width W_{11} of first corner post panel **184**, first reinforcing end panel **168**, and second corner post panel **186** is wider than a width W_{12} of first end panel **112**. Each corner post panel **184** and **186** is separated from first end panel **112** by a cut line **192**. Further, a cutout **194** is defined in first reinforcing end panel **168** along a top portion **196** of cut line **182**. In the exemplary embodiment, cutout **194** is semi-circular. However, it should be understood that cutout **194** can have any suitable shape, configuration, and/or position with respect to first top end panel **170** that enables blank **100** and/or container **300** to function as described herein.

First bottom end panel **172** is generally rectangular and has a depth D_{15} that corresponds to a location of locking slots **150**, **152**, **164**, and/or **166** defined in bottom side panels **132** and **156**. In the exemplary embodiment, a free edge **198** of first bottom end panel **172** defines a first locking tab **200** and a second locking tab **202**. More specifically, free edge **198** includes a first angled portion **204**, a first horizontal portion **206**, a first notch **208**, a middle indent **210**, a second notch **212**, a second horizontal portion **214**, and a second angled portion **216**. First locking tab **200** is defined by first angled portion **204**, first horizontal portion **206**, and first notch **208**, and second locking tab **202** is defined by second notch **212**, second horizontal portion **214**, and second angled portion **216**. Alternatively, locking tabs **200** and/or **202** and/or free edge **198** have any suitable configuration that enables blank **100** and/or container **300** to function as described herein. Further, in an alternative embodiment, middle indent **210** is not defined by free edge **198**. In the exemplary embodiment, first bottom end panel **172** further includes a line of weakness **218** extending across first bottom end panel **172** substantially parallel to fold line **180**. Line of weakness **218** divides first bottom end panel **172** into a first portion **220** extending from fold line **180** and a second portion **222** extending from line of weakness **218** to free edge **198**. In an alternative embodiment, first bottom end panel **172** does not include line of weakness **218**.

Similarly, second end panel **116** includes a second reinforcing end panel **224**, a second top end panel **226**, and a second bottom end panel **228** extending therefrom along respective fold lines **230**, **232**, **234**, and **236**. More specifically, second reinforcing end panel **224** extends from second end panel **116** along double fold lines **230** and **232**, second top end panel **226** extends from second end panel **116** along fold line **234**, and second bottom end panel **228** extends from second end panel **116** along fold line **236**. In the exemplary embodiment, second top end panel **226** is defined within second reinforcing end panel **224** by cut line **182**. More specifically, cut line **182** defines a substantially rectangular and/or square shape of second top end panel **226**. Alternatively, second top end panel **226** can have any suitable shape that enables blank **100** and/or container **300** to function as described herein. In a particular embodiment, blank **100** does not include second top end panel **226**.

In the exemplary embodiment, second reinforcing end panel **224** is substantially rectangular and has depth D_{14}. Alternatively, second reinforcing end panel **224** has any suitable depth that enables blank **100** and/or container **300** to function as described herein. In the exemplary embodiment, second reinforcing end panel **224** includes a third corner post panel **238** and a fourth corner post panel **240** extending therefrom along respective fold lines **242** and **244**. More specifically, third corner post panel **238** extends from second reinforcing end panel **224** along fold line **242**, and fourth corner post panel **240** extends from second reinforcing end panel **224** along fold line **244**. Width W_{11} of third corner post panel **238**, second reinforcing end panel **224**, and fourth corner post panel **240** is wider than width W_{12} of second end panel **116**. Alternatively, third corner post panel **238**, second reinforcing end panel **224**, and fourth corner post panel **240** has a width other than width W_{11} and/or second end panel **116** has a width other than width W_{12}. In the exemplary embodiment, each corner post panel **238** and **240** is separated from second end panel **116** by cut line **192**. Corner post panels **184**, **186**, **238**, and **240** are substantially congruent in the exemplary embodiment; however, it should be understood that corner post panels **184**, **186**, **238**, and/or **240** can have any suitable size, shape, and/or configuration that enables blank **100** and/or container **300** to function as described herein.

A side reinforcing panel **246** extends from fourth corner post panel **240** along a fold line **248**. In the exemplary embodiment, side reinforcing panel **246** is substantially congruent to fourth corner post panel **240** and extends to about trailing edge **108**; however, it should be understood that side reinforcing panel **246** can have any suitable shape and/or

configuration that enables blank **100** and/or container **300** to function as described herein. Further, in the exemplary embodiment, cutout **194** is defined in second reinforcing end panel **224** along top portion **196** of cut line **182**. Alternatively, second reinforcing end panel **224** does not include cutout **194**.

Second bottom end panel **228** is generally rectangular and has depth D_{15} that corresponds to a location of locking slots **150**, **152**, **164**, and/or **166** defined in bottom side panels **132** and **156**. Alternatively, second bottom end panel **228** has any suitable depth that enables blank **100** and/or container **300** to function as described herein. In the exemplary embodiment, a free edge **250** of second bottom end panel **228** defines a third locking tab **252** and a fourth locking tab **254**. More specifically, free edge **250** includes a third angled portion **256**, a third horizontal portion **258**, a third notch **260**, middle indent **210**, a fourth notch **262**, a fourth horizontal portion **264**, and a fourth angled portion **266**. Third locking tab **252** is defined by third angled portion **256**, third horizontal portion **258**, and third notch **260**, and fourth locking tab **254** is defined by fourth notch **262**, fourth horizontal portion **264**, and fourth angled portion **266**. Alternatively, locking tabs **252** and/or **254** and/or free edge **250** have any suitable configuration that enables blank **100** and/or container **300** to function as described herein. Further, in an alternative embodiment, middle indent **210** is not defined by free edge **250**.

In the exemplary embodiment, second bottom end panel **228** further includes line of weakness **218** extending across second bottom end panel **228** substantially parallel to fold line **236**. Line of weakness **218** divides second bottom end panel **228** into first portion **220** extending from fold line **236** and second portion **222** extending from line of weakness **218** to free edge **250**. In an alternative embodiment, second bottom end panel **228** does not include line of weakness **218**.

A cut line **268** separates first top side panel **130** from first corner post panel **184**, a cut line **270** separates second corner post panel **186** from second top side panel **154**, and a cut line **272** separates second top side panel **154** from third corner post panel **238**. Further, a slot **274** separates first bottom side panel **132** from first bottom end panel **172**, a slot **276** separates first bottom end panel **172** from second bottom side panel **156**, and a slot **278** separates second bottom side panel **156** from second bottom end panel **228**. Alternatively, slots can separate any of panels **130**, **184**, **186**, **154**, and/or **238** and/or cut lines can separate any of panels **132**, **172**, **156**, and/or **228**. In the exemplary embodiment, a bottom locking mechanism **280** includes locking slots **150**, **152**, **164**, and **166** and locking tabs **200**, **202**, **252**, and **254**. Alternatively, bottom locking mechanism **280** can include any suitable components and/or configuration that enables container **300** to be formed from blank **100**.

Referring to FIGS. **1-4**, to construct container **300** from blank **100**, first side panel **110** is rotated about fold line **120** toward interior surface **102** of first end panel **112**, first end panel **112** is rotated about fold line **122** toward interior surface **102** of second side panel **114**, second side panel **114** is rotated about fold line **124** toward interior surface **102** of second end panel **116**, and glue flap **118** is rotated about fold line **126** toward interior surface **102** of second end panel **116**. In the exemplary embodiment, after rotating panels **110**, **112**, **114**, and **116** and glue flap **118** about fold lines **120**, **122**, **124**, and **126**, side panels **110** and **114** are substantially parallel to each other and substantially perpendicular to end panels **112** and **116**. Panels **110**, **112**, **114**, and **116** and glue flap **118** can be rotated about fold lines **120**, **122**, **124**, and **126** by wrapping blank **100** about a mandrel within a machine. Alternatively, a folder/glue machine can be used to convey blank **100** through folder arms and adhesive applicator to form a knocked-down flat container.

Once **110**, **112**, **114**, and **116** and glue flap **118** are rotated about fold lines **120**, **122**, **124**, and **126**, glue flap **118** is coupled to first side panel **110**. For example, in the exemplary embodiment, interior surface **102** of glue flap **118** is adhered to exterior surface **104** of first side panel **110**. Alternatively, exterior surface **104** of glue flap **118** is adhered to interior surface **102** of first side panel **110**. Further, although adhesive is described herein, glue flap **118** can be coupled to first side panel **110** using any suitable fastener and/or technique. In the exemplary embodiment, once glue flap **118** is coupled to first side panel **110**, first side panel **110** and glue flap **118** form a first side wall **302** of container **300**, and second side panel **114** forms a second side wall **304** of container **300**. From this configuration, partially formed container **300** can be collapsed into a knocked-down flat configuration for shipping and/or storage of container **300**.

To continue construction of container **300**, first bottom side panel **132** is rotated about fold line **136** toward interior surface **102** of first side panel **110**, and second bottom side panel **156** is rotated about fold line **160** toward interior surface **102** of second side panel **114**. In the exemplary embodiment, first bottom side panel **132** is substantially perpendicular to first side wall **302**, and second bottom side panel **156** is substantially perpendicular to second side wall **304**. First bottom end panel **172** is rotated about fold line **180** toward interior surface **102** of first end panel **112**. Second portion **222** of first bottom end panel **172** is rotated slightly about line of weakness **218** toward interior surface **102** of first portion **220**. In the exemplary embodiment, first bottom end panel **172** is not creased at line of weakness **218** when second portion **222** is rotated toward first portion **220**. Rather, the slight rotation of second portion **222** facilitates inserting first locking tab **200** into second locking slot **152** and inserting second locking tab **202** into third locking slot **164**. When first locking tab **200** is inserted into second locking slot **152**, first notch **208** rests against an edge surrounding second locking slot **152**. Similarly, when second locking tab **202** is inserted into third locking slot **164**, second notch **212** rests against an edge surrounding third locking slot **164**.

Further, second bottom end panel **228** is rotated about fold line **236** toward interior surface **102** of second end panel **116**. Second portion **222** of second bottom end panel **228** is rotated slightly about line of weakness **218** toward interior surface **102** of first portion **220**. In the exemplary embodiment, second bottom end panel **228** is not creased at line of weakness **218** when second portion **222** is rotated toward first portion **220**. Rather, the slight rotation of second portion **222** facilitates inserting third locking tab **252** into fourth locking slot **166** and inserting fourth locking tab **254** into first locking slot **150**. When third locking tab **252** is inserted into fourth locking slot **166**, third notch **260** rests against an edge surrounding fourth locking slot **166**. Similarly, when fourth locking tab **254** is inserted into first locking slot **150**, fourth notch **262** rests against an edge surrounding first locking slot **150**. As such, bottom locking mechanism **280** interlocks bottom side panels **132** and **156** and bottom end panels **172** and **228** to form a bottom wall **306** of container **300**, as shown in FIGS. **2** and **4**.

First corner post panel **184** is rotated about fold line **188** toward exterior surface **104** of first reinforcing end panel **168**, and second corner post panel **186** is rotated about fold line **190** toward exterior surface **104** of first reinforcing end panel **168**. In the exemplary embodiment, after rotation about fold lines **188** and **190**, exterior surface **104** of corner post panels

184 and 186 are oriented at approximately 135° with respect to exterior surface 104 of first reinforcing end panel 168. Alternatively, exterior surface 104 of corner post panels 184 and 186 can be oriented at any suitable angled with respect to exterior surface 104 of first reinforcing end panel 168. In the exemplary embodiment, first reinforcing end panel 168 is rotated about double fold lines 174 and 176 toward interior surface 102 of first end panel 112. As first reinforcing end panel 168 is rotated, first top end panel 170 remains substantially planar with and extending upwardly from first end panel 112. First reinforcing end panel 168 is rotated into face-to-face relationship with first end panel 112. More specifically, interior surface 102 of first reinforcing end panel 168 is directly adjacent to and/or in direct contact with interior surface 102 of first end panel 112. A free edge 282 of first corner post panel 184 is adjacent first side wall 302, and a free edge 284 of second corner post panel 186 is adjacent second side wall 304. First end panel 112 and first reinforcing end panel 168 form a first end wall 308, first corner post panel 184 forms a first corner post 310, and second corner post panel 186 forms a second corner post 312.

Third corner post panel 238 is rotated about fold line 242 toward exterior surface 104 of second reinforcing end panel 224, fourth corner post panel 240 is rotated about fold line 244 toward exterior surface 104 of second reinforcing end panel 224, and side reinforcing panel 246 is rotated about fold line 248 toward exterior surface 104 of fourth corner post panel 240. In the exemplary embodiment, after rotation about fold lines 242, 244, and 248, exterior surface 104 of corner post panels 238 and 240 are oriented at approximately 135° with respect to exterior surface 104 of second reinforcing end panel 224 and exterior surface 104 of side reinforcing panel 246 is oriented at approximately 135° with respect to exterior surface 104 of fourth corner post panel 240. As such, exterior surface 104 of side reinforcing panel 246 is oriented substantially perpendicularly to exterior surface 104 of second reinforcing end panel 224. Alternatively, exterior surface 104 of corner post panels 238 and/or 240 and/or side reinforcing panel 246 can be oriented at any suitable angled with respect to exterior surface 104 of second reinforcing end panel 224.

In the exemplary embodiment, second reinforcing end panel 224 is rotated about double fold lines 230 and 232 toward interior surface 102 of second end panel 116. As second reinforcing end panel 224 is rotated, second top end panel 226 remains substantially planar with and extending upwardly from second end panel 116. Second reinforcing end panel 224 is rotated into face-to-face relationship with second end panel 116. More specifically, interior surface 102 of second reinforcing end panel 224 is directly adjacent to and/or in direct contact with interior surface 102 of second end panel 116. A free edge 286 of third corner post panel 238 is adjacent second side wall 304, and side reinforcing panel 246 is rotated into face-to-face relationship with first side wall 302. More specifically, interior surface 102 of side reinforcing panel 246 is directly adjacent to and/or in direct contact with interior surface 102 of first side panel 110. As such, side reinforcing panel 246 is included in first side wall 302. Second end panel 116 and second reinforcing end panel 224 form a second end wall 314, third corner post panel 238 forms a third corner post 316, and fourth corner post panel 240 forms a fourth corner post 318. Corner posts 310, 312, 316, and 318, side walls 302 and 304, end walls 308 and 314, and bottom wall 306 define a cavity 320 of container 300. When corner posts 310, 312, 316, and 318, side walls 302 and 304, end walls 308 and 314, and bottom wall 306, container 300 is considered to be in an open configuration, as shown in FIG. 2.

To close container 300, first top end panel 170 is rotated about fold line 178 toward interior surface 102 of first end panel 112, and second top end panel 226 is rotated about fold line 234 toward interior surface 102 of second end panel 116. More specifically, after rotation, first top end panel 170 is substantially perpendicular to first end panel 112 and second top end panel 226 is substantially perpendicular to second end panel 116. First top side panel 130 is rotated about fold line 134 toward interior surface 102 of first side panel 110, and second top side panel 154 is rotated about fold line 158 toward interior surface 102 of second side panel 114. More specifically, after rotation, first top side panel 130 is substantially perpendicular to first side panel 110 and second top side panel 154 is substantially perpendicular to second side panel 114. In the exemplary embodiment, top side panels 130 and 154 overlap when top side panels 130 and 154 are substantially parallel to bottom wall 306. Alternatively, top side panels 130 and 154 are sized such that top side panels 130 and 154 do not overlap when top side panels 130 and 154 are substantially parallel to bottom wall 306. In the exemplary embodiment, top side panels 130 and 154 rest on top end panels 170 and 226 while at least top side panels 130 and 154 are secured together using, for example, tape. As such, interior surface 102 of top side panels 130 and/or 154 is adjacent to and/or in direct contact with exterior surface 104 of top end panels 170 and 226. Top side panels 130 and 154 and top end panels 170 and 226 define top wall 322 of container 300.

FIG. 5 is a top plan view a first alternative blank 400 of sheet material. FIG. 6 is a top perspective view of a container 450 formed from blank 400. FIG. 7 is a top perspective view of container 450 with a top wall 452 formed. Unless otherwise described, blank 400 includes components that are similar to the components described above with reference to blank 100 (shown in FIG. 1), and container 450 includes components that are similar to the components described above with reference to container 300 (shown in FIGS. 2-4). As such, components shown in FIGS. 1-4 are labeled with similar reference numbers in FIGS. 5-7.

Referring to FIG. 5, first side panel 110 includes a first top side panel 402 and first bottom side panel 132 extending therefrom along respective fold lines 134 and 136. More specifically, first top side panel 402 extends from first side panel 110 along fold line 134, and first bottom side panel 132 extends from first side panel 110 along fold line 136. In the exemplary embodiment, first top side panel 402 is substantially rectangular and has a depth D_{21} that is about half of depth D_{12} (shown in FIG. 6) of container 450. Alternatively, first top side panel 402 has any suitable depth that enables blank 400 and/or container 450 to function as described herein. In the exemplary embodiment, a removable alignment panel 404 extends from a top edge 406 of first top side panel 402 at a score line 408. Alignment panel 404 has a free edge 410 that substantially aligns with a widest portion of blank 400, such as free edges 412 and/or 414 of reinforcing end panels 168 and/or 224, respectively. Alternatively, blank 400 does not include alignment panel 404.

Similarly, second side panel 114 includes a second top side panel 416 and second bottom side panel 156 extending therefrom along respective fold lines 158 and 160. More specifically, second top side panel 416 extends from second side panel 114 along fold line 158, and second bottom side panel 156 extends from second side panel 114 along fold line 160. In the exemplary embodiment, second top side panel 416 is substantially rectangular and has depth D_{21}. Alternatively, second top side panel 416 has any suitable depth, such as a depth other than depth D_{21}, that enables blank 400 and/or container 450 to function as described herein.

In the exemplary embodiment, panels **110**, **112**, **114**, **132**, **156**, and **168** each include vent holes **418**. It should be understood that any panel and/or portion of blank **400** can include vent holes **418** having any suitable shape and/or configuration. In a particular embodiment, blank **400** does not include any vent holes **418**.

Referring to FIGS. **5-7**, container **450** is constructed from blank **400** in a manner similar to constructing container **300** (shown in FIGS. **2-4**) from blank **100** (shown in FIG. **1**). However, to close container **450**, alignment panel **404** is removed from first top side panel **402** at score line **408**. First top end panel **170** is rotated about fold line **178** toward interior surface **102** of first end panel **112**, and second top end panel **226** is rotated about fold line **234** toward interior surface **102** of second end panel **116**. More specifically, after rotation, first top end panel **170** is substantially perpendicular to first end panel **112** and second top end panel **226** is substantially perpendicular to second end panel **116**. First top side panel **402** is rotated about fold line **134** toward interior surface **102** of first side panel **110**, and second top side panel **416** is rotated about fold line **158** toward interior surface **102** of second side panel **114**. More specifically, after rotation, first top side panel **402** is substantially perpendicular to first side panel **110** and second top side panel **416** is substantially perpendicular to second side panel **114**.

In the exemplary embodiment, top side panels **402** and **416** define a gap **454** therebetween when top side panels **402** and **416** are substantially parallel to bottom wall **306**. Alternatively, top side panels **402** and **416** are sized such that gap **454** is not defined when top side panels **402** and **416** are substantially parallel to bottom wall **306**. In the exemplary embodiment, top side panels **402** and **416** rest on top end panels **170** and **226** while at least top side panels **402** and **416** are secured together using, for example, tape. As such, interior surface **102** of top side panels **402** and/or **416** is adjacent to and/or in direct contact with exterior surface **104** of top end panels **170** and/or **226**. Top side panels **402** and **416** and top end panels **170** and **226** define top wall **452** of container **450**.

FIG. **8** is a top plan view of a second alternative blank **500** of sheet material. FIG. **9** is a top perspective view of a container **560** formed from blank **500**. FIG. **10** is a top perspective view of container **560** with a top wall **562** formed. Unless otherwise described, blank **500** includes components that are similar to the components described above with reference to blank **100** (shown in FIG. **1**), and container **560** includes components that are similar to the components described above with reference to container **300** (shown in FIGS. **2-4**). As such, components shown in FIGS. **1-4** are labeled with similar reference numbers in FIGS. **8-10**.

Referring to FIG. **8**, first side panel **110** includes a first top side panel **502** and first bottom side panel **132** extending therefrom along respective fold lines **134** and **136**. More specifically, first top side panel **502** extends from first side panel **110** along fold line **134**, and first bottom side panel **132** extends from first side panel **110** along fold line **136**. In the exemplary embodiment, first top side panel **502** is substantially rectangular and has a depth D_{31} that is more than half of a depth D_{12} (shown in FIG. **9**) of container **560**. Alternatively, first top side panel **502** has any suitable depth that enables blank **500** and/or container **560** to function as described herein. In the exemplary embodiment, first top side panel **502** includes a first locking cutout **504** and a second locking cutout **506**. Locking cutouts **504** and **506** are each substantially rectangular with a semi-circular extension **508**, and second locking cutout **506** is a mirror-image of first locking cutout **504**. Alternatively, locking cutouts **504** and/or **506** can have any suitable shape, size, and/or configuration that enables blank **500** and/or container **560** to function as described herein.

Similarly, second side panel **114** includes a second top side panel **510** and second bottom side panel **156** extending therefrom along respective fold lines **158** and **160**. More specifically, second top side panel **510** extends from second side panel **114** along fold line **158**, and second bottom side panel **156** extends from second side panel **114** along fold line **160**. In the exemplary embodiment, second top side panel **510** is substantially rectangular and has depth D_{31}. Alternatively, second top side panel **510** has any suitable depth that enables blank **500** and/or container **560** to function as described herein. In the exemplary embodiment, second top side panel **510** includes a first locking flap **512** and a second locking flap **514**. Each locking flap **512** and **514** is defined by a cut line **516** and a fold line **518**. Further, a minor cutout **520** is defined adjacent a free edge **522** of each locking flap **512** and **514**. Alternatively, second top side panel **510** does not include cutouts **520**. In the exemplary embodiment, locking flaps **512** and **514** are positioned to align with second locking cutout **506** and first locking cutout **504**, respectively, when container **560** is formed.

First end panel **112** includes first reinforcing end panel **168**, a first top end panel **524**, and first bottom end panel **172** extending therefrom along respective fold lines **174**, **176**, **178**, and **180**. More specifically, first top end panel **524** extends from first end panel **112** along fold line **178**. In the exemplary embodiment, first top end panel **524** is defined within first reinforcing end panel **168** by a cut line **526**. More specifically, cut line **526** defines a substantially rectangular and/or square shape of first top end panel **524**. Alternatively, first top end panel **524** can have any suitable shape that enables blank **500** and/or container **560** to function as described herein.

In the exemplary embodiment, first top end panel **524** includes a first locking mechanism **528** having a top support panel **530** and a locking tab **532**. Locking tab **532** includes a center portion **534**, a first side portion **536** extending from center portion **534** along a fold line **538**, and a second side portion **540** extending from center portion **534** along a fold line **542**. Center portion **534** extends from top support panel **530** along a double fold line **544** and is separated from top support panel **530** at cut lines **546**. Side portions **536** and **540** are separated from top support panel **530** by cut lines **548**.

Similarly, second end panel **116** includes second reinforcing end panel **224**, a second top end panel **550**, and second bottom end panel **228** extending therefrom along respective fold lines **230**, **232**, **234**, and **236**. More specifically, second top end panel **550** extends from second end panel **116** along fold line **234**. In the exemplary embodiment, second top end panel **550** is defined within second reinforcing end panel **224** by cut line **526**. More specifically, cut line **526** defines a substantially rectangular and/or square shape of second top end panel **550**. Alternatively, second top end panel **550** can have any suitable shape that enables blank **500** and/or container **560** to function as described herein. In the exemplary embodiment, second top end panel **550** includes a second locking mechanism **552** having top support panel **530** and locking tab **532**, as described above. A top locking mechanism **554** includes locking cutouts **504** and **506**, locking flaps **512** and **514**, and locking mechanisms **528** and **552**.

Referring to FIGS. **8-10**, container **560** is constructed from blank **500** in a manner similar to constructing container **300** (shown in FIGS. **2-4**) from blank **100** (shown in FIG. **1**). However, to close container **560**, first top end panel **524** is rotated about fold line **178** toward interior surface **102** of first

end panel **112**, and second top end panel **550** is rotated about fold line **234** toward interior surface **102** of second end panel **116**. Side portions **536** and **540** are rotated about fold lines **538** and **542** toward exterior surface **104** of center portion **534** for each locking mechanism **528** and **552**. Alternatively, side portions **536** and **540** are rotated about fold lines **538** and **542** toward interior surface **102** of center portion **534** for each locking mechanism **528** and/or **552**. In the exemplary embodiment, locking tabs **532** are folded slightly about double fold lines **544** toward exterior surface **104** of top support panel **530**. First top side panel **502** is rotated about fold line **134** toward interior surface **102** of first side panel **110** such that locking tab **532** of first locking mechanism **528** extends through second locking cutout **506** and locking tab **532** of second locking mechanism **552** extends through first locking cutout **504**.

Second top side panel **510** is rotated about fold line **158** toward interior surface **102** of second side panel **114**. Locking tab **532** of first locking mechanism **528** extends through minor cutout **520** adjacent first locking flap **512**, and locking tab **532** of second locking mechanism **552** extends through minor cutout **520** adjacent second locking flap **514**. Alternatively, locking tabs **532** can be pulled upward through locking cutouts **504** and/or **506** and minor cutouts **520** after top side panels **502** and **510** have been rotated about fold lines **134** and **158**. In the exemplary embodiment, locking flaps **512** and **514** are rotated slightly about fold lines **518** toward exterior surface **104** of second top side panel **510**, and free edges **522** of each locking tab **512** and **514** rest against interior surface **102** of a respective locking tab center portion **534**. To secure top locking mechanism **554**, side portions **536** and **540** are unfolded with respect to each center portion **534** such that bottom edges **564** of side portions **536** and **540** are adjacent to or in direct contact with exterior surface **104** of second top side panel **510**. When container **560** is locked, top support panels **530** and top side panels **502** and **510** are substantially parallel to bottom wall **306**. Further, top support panels **530** and top side panels **502** and **510** form top wall **562** of container **560**.

Alternatively, first top side panel **502** is rotated about fold line **134** toward interior surface **102** of first side panel **110**, and second top side panel **510** is rotated about fold line **158** toward interior surface **102** of second side panel **114**. In one embodiment, interior surface **102** of second top side panel **510** is in face-to-face relationship with exterior surface **104** of first top side panel **502**. In an alternative embodiment, interior surface **102** of first top side panel **502** is in face-to-face relationship with exterior surface **104** of second top side panel **510**. First top side panel **524** is then rotated about fold line **178** toward interior surface **102** of first end panel **112**, and second top end panel **550** is rotated about fold line **234** toward interior surface **102** of second end panel **116**. Side portions **536** and **540** are rotated about fold lines **538** and **542** toward exterior surface **104** of center portion **534** for each locking mechanism **528** and **552**. Alternatively, side portions **536** and **540** are rotated about fold lines **538** and **542** toward interior surface **102** of center portion **534** for each locking mechanism **528** and/or **552**. In the exemplary embodiment, locking tabs **532** are folded slightly about double fold lines **544** toward interior surface **102** of top support panel **530**. Locking tabs **532** are then inserted into minor cutout **520** and locking cutout **504** and/or **506** to secure top panels **168**, **224**, **502**, and **510** together. In such an embodiment, interior surface **102** of top support panels **530** is in face-to-face relationship with exterior surface **104** of first top side panel **502** and/or second top side panel **510**.

FIG. **11** is a top plan view of a third alternative blank **600** of sheet material. FIG. **12** is a top perspective view of a container **650** formed from blank **600**. FIG. **13** is a top perspective view of container **650** with a top wall **652** formed. Unless otherwise described, blank **600** includes components that are similar to the components described above with reference to blank **100** (shown in FIG. **1**) and blank **500** (shown in FIG. **8**), and container **650** includes components that are similar to the components described above with reference to container **300** (shown in FIGS. **2-4**) and container **560** (shown in FIGS. **9** and **10**). As such, components shown in FIGS. **1-4** and **8-10** are labeled with similar reference numbers in FIGS. **11-13**.

Referring to FIG. **11**, in the exemplary embodiment, first top side panel **502** includes a first cutout **602** and a second cutout **604**. Cutouts **602** and **604** are each substantially rectangular with semi-circular extension **508**, and second cutout **604** is a shorter, mirror-image of first cutout **602**. More specifically, second cutout **604** is shorter than first cutout **602** to account for a second side reinforcing panel **606**. Alternatively, cutouts **602** and/or **604** can have any suitable shape, size, and/or configuration that enables blank **600** and/or container **650** to function as described herein. Further, in the exemplary embodiment, second top side panel **510** includes a first locking flap **608** and a second locking flap **610**. Each locking flap **608** and **610** is defined by cut line **516** and fold line **518**. Further, minor cutout **520** is defined adjacent free edge **522** of each locking flap **608** and **610**. Alternatively, second top side panel **510** does not include minor cutouts **520**. In the exemplary embodiment, locking flaps **608** and **610** are positioned to align with second cutout **604** and first cutout **602**, respectively, when container **650** is formed. Further, in the exemplary embodiment, first locking flap **608** is slightly shorter than second locking flap **610** to account for second side reinforcing panel **606** extending into second top side panel **510**.

First end panel **112** includes first reinforcing end panel **168**, a first top end panel **612**, and first bottom end panel **172** extending therefrom along respective fold lines **174**, **176**, **178**, and **180**. More specifically, first top end panel **612** extends from first end panel **112** along fold line **178**. In the exemplary embodiment, first top end panel **612** is defined within first reinforcing end panel **168** by a cut line **614**. More specifically, cut line **614** defines a substantially rectangular and/or square shape of first top end panel **612**. Alternatively, first top end panel **612** can have any suitable shape that enables blank **600** and/or container **650** to function as described herein.

First top end panel **612** includes a first locking mechanism **616** having a top support panel **618** and a locking tab **620**. Locking tab **620** includes a center portion **622**, a first side portion **624** extending from center portion **622** along a fold line **626**, and a second side portion **628** extending from center portion **622** along fold line **630**. Center portion **622** extends from top support panel **618** along a double fold line **632** and is separated from top support panel **618** and cut lines **634**. Side portions **624** and **628** are separated from top support panel **618** by cut lines **636**. In the exemplary embodiment, top support panel **618** is longer than top support panel **530** to account for second side reinforcing panel **606** extending into second top side panel **510**. A top locking mechanism **638** includes cutouts **602** and **604**, locking flaps **608** and **610**, and locking mechanisms **616** and **552**.

In the exemplary embodiment, first reinforcing end panel **168** includes second side reinforcing panel **606** extending from second corner post panel **186** along a fold line **640**. A cut line **642** separates second side reinforcing panel **606** from second top side panel **510**. In the exemplary embodiment,

second side reinforcing panel **606** is substantially congruent to second corner post panel **186** and extends into second top side panel **510**; however, it should be understood that second side reinforcing panel **606** can have any suitable shape and/or configuration that enables blank **600** and/or container **650** to function as described herein.

Referring to FIGS. **11-13**, container **650** is constructed from blank **600** in a manner similar to constructing container **560** (shown in FIGS. **9** and **10**) from blank **500** (shown in FIG. **8**). However, second side reinforcing panel **606** is rotated about fold line **640** toward exterior surface **104** of second corner post panel **186**. In the exemplary embodiment, after rotation about fold lines **188**, **190**, and **640**, exterior surface **104** of corner post panels **184** and **186** are oriented at approximately 135° with respect to exterior surface **104** of first reinforcing end panel **168** and exterior surface **104** of second side reinforcing panel **606** is oriented at approximately 135° with respect to exterior surface **104** of second corner post panel **186**. As such, exterior surface **104** of second side reinforcing panel **606** is oriented substantially perpendicularly to exterior surface **104** of first reinforcing end panel **168**. Alternatively, exterior surface **104** of corner post panels **184** and/or **186** and/or second side reinforcing panel **606** can be oriented at any suitable angled with respect to exterior surface **104** of first reinforcing end panel **168**.

When first reinforcing end panel **168** is rotated about double fold lines **174** and **176** toward interior surface **102** of first end panel **112**, second side reinforcing panel **606** is rotated into face-to-face relationship with second side panel **114**. More specifically, interior surface **102** of second side reinforcing panel **606** is directly adjacent to and/or in direct contact with interior surface **102** of second side panel **114**. As such, second side reinforcing panel **606** is included in a second side wall **654**. Container **650** is closed similarly to container **560**; however top wall **652** of container **650** includes a gap **656** where second side reinforcing panel **606** extended into second top side panel **510** before container **650** was formed.

FIG. **14** is a top plan view of a fourth alternative blank **700** of sheet material. FIG. **15** is a top perspective view of a container **850** formed from blank **700**. FIG. **16** is a top perspective view of container **850** with a top wall **852** formed. FIG. **17** is a bottom perspective view of container **850**. Unless otherwise described, blank **700** includes components that are similar to the components described above with reference to blank **100** (shown in FIG. **1**) and blank **400** (shown in FIG. **5**), and container **850** includes components that are similar to the components described above with reference to container **300** (shown in FIGS. **2-4**) and container **450** (shown in FIGS. **6** and **7**). As such, components shown in FIGS. **1-7** are labeled with similar reference numbers in FIGS. **14-17**.

Referring to FIG. **14**, blank **700** includes, from leading edge **106** to trailing edge **108**, a first corner panel **702**, a first side panel **704**, a second corner panel **706**, a first end panel **708**, a third corner panel **710**, a second side panel **712**, a fourth corner panel **714**, a second end panel **716**, and a glue flap **718** coupled together along preformed, generally parallel, fold lines **720**, **722**, **724**, **726**, **728**, **730**, **732**, and **734**, respectively. In the exemplary embodiment, corner panels **702**, **706**, **710**, and **714** are each substantially congruent; however, it should be understood that corner panels **702**, **706**, **710**, and/or **714** can each have any suitable size, shape, and/or configuration that enables blank **700** and/or container **850** to function as described herein.

First corner panel **702** extends from first side panel **704** along fold line **720**, second corner panel **706** extends from first side panel **704** along fold line **722**, first end panel **708** extends from second corner panel **706** along fold line **724**, third corner panel **710** extends from first end panel **708** along fold line **726**, second side panel **712** extends from third corner panel **710** along fold line **728**, fourth corner panel **714** extends from second side panel **712** along fold line **730**, second end panel **716** extends from fourth corner panel **714** along fold line **734**, and glue flap **718** extends from second end panel **716** along fold line **734**. Fold lines **720**, **722**, **724**, **726**, **728**, **730**, **732**, and/or **734**, as well as other fold lines and/or hinge lines described herein, may include any suitable line of weakening and/or line of separation known to those skilled in the art and guided by the teachings herein provided. In the exemplary embodiment, panels **704**, **712**, and **168** each include vent holes **418**. It should be understood that any panel and/or portion of blank **700** can include vent holes **418** having any suitable shape and/or configuration. In a particular embodiment, blank **700** does not include any vent holes **418**.

First side panel **704** includes first top side panel **402** and a first bottom side panel **736** extending therefrom along respective fold lines **134** and **136**. More specifically, first top side panel **402** extends from first side panel **704** along fold line **134**, and first bottom side panel **736** extends from first side panel **704** along fold line **136**. In the exemplary embodiment, first corner post panel **184** and second corner post panel **186** are each separated from corner panels **706** and **710**, respectively, by a cutout **737**. First bottom side panel **736** has a depth D_{51} that is more than about half of depth D_{12} (shown in FIG. **15**) of container **850**. Alternatively, first bottom side panel **736** has any suitable depth that enables blank **700** and/or container **850** to function as described herein. In the exemplary embodiment, first bottom side panel **736** includes a locking tab **738** defined by a free edge **740**. Locking tab **738** has a width W_{51}.

More specifically, free edge **740** includes a first outwardly angled portion **742**, a first vertical portion **744**, a first inwardly angled portion **746**, a second vertical portion **748**, a horizontal portion **750**, a third vertical portion **752**, a second inwardly angled portion **754**, a fourth vertical portion **756**, and a second outwardly angled portion **758**. Outwardly angled portions **742** and **758** are configured based on angles of a first corner wall **854** and a second corner wall **856**, respectively. First outwardly angled portion **742**, first vertical portion **744**, and first inwardly angled portion **746** define a first corner projection **760**, and second inwardly angled portion **754**, fourth vertical portion **756**, and second outwardly angled portion **758** define a second corner projection **762**. Locking tab **738** is defined by second vertical portion **748**, horizontal portion **750**, and third vertical portion **752**.

Similarly, second side panel **712** includes second top side panel **416** and a second bottom side panel **764** extending therefrom along respective fold lines **158** and **160**. More specifically, second top side panel **416** extends from second side panel **712** along fold line **158**, and second bottom side panel **764** extends from second side panel **712** along fold line **160**. Third corner post panel **238** and fourth corner post panel **240** are each separated from corner panel **714** and glue flap **718**, respectively, by cutout **737**. In the exemplary embodiment, second bottom side panel **764** has depth D_{51}; however, second bottom side panel **764** can have any suitable depth that enables blank **700** and/or container **850** to function as described herein. In the exemplary embodiment, second bottom side panel **764** includes a free edge **766** that defines a locking slot **768** having a width W_{52} that is slightly wider than width W_{51}.

In the exemplary embodiment, free edge **766** includes a first outwardly angled portion **770**, a first vertical portion **772**, a first horizontal portion **774**, a second vertical portion **776**, a

second horizontal portion **778**, a third vertical portion **780**, a third horizontal portion **782**, a fourth vertical portion **784**, and a second outwardly angled portion **786**. Outwardly angled portions **770** and **786** are configured based on angles of a third corner wall **858** and a fourth corner wall **860**, respectively. Locking slot **768** is at least partially defined by second vertical portion **776**, second horizontal portion **778**, and third horizontal portion **780**.

First end panel **708** includes first reinforcing end panel **168**, first top end panel **170**, and a first bottom end panel **788** extending therefrom along respective fold lines **174**, **176**, **178**, and **180**. More specifically, first bottom end panel **788** extends from first end panel **708** along fold line **180**. First bottom end panel **788** has depth D_{51}; however, first bottom end panel **788** can have any suitable depth that enables blank **700** and/or container **850** to function as described herein. A free edge **790** of first bottom end panel **788** defines a first locking extension **792**.

More specifically, free edge **790** includes a first outwardly angled portion **794**, a first vertical portion **796**, a horizontal portion **798**, a second vertical portion **800**, an inwardly angled portion **802**, a third vertical portion **804**, and a second outwardly angled portion **806**. Third vertical portion **804** is separated from first vertical portion **772** of second bottom side panel **764** by a cut line **808**. Outwardly angled portions **794** and **806** are configured based on angles of second corner wall **856** and third corner wall **858**, respectively. Second outwardly angled portion **806**, third vertical portion **804**, and inwardly angled portion **802** define a third corner projection **810**. First locking extension **792** is defined by first vertical portion **796**, horizontal portion **798**, and second vertical portion **800**.

Similarly, second end panel **716** includes second reinforcing end panel **224**, second top end panel **226**, and a second bottom end panel **812** extending therefrom along respective fold lines **230**, **232**, **234**, and **236**. More specifically, second bottom end panel **812** extends from second end panel **716** along fold line **236**. In the exemplary embodiment, second bottom end panel **812** has depth D_{51} and is substantially a mirror-image of first bottom end panel **788**. Alternatively, second bottom end panel **812** has any suitable depth and/or configuration that enables blank **700** and/or container **850** to function as described herein.

In the exemplary embodiment, a free edge **814** of second bottom end panel **812** defines a second locking extension **816**. More specifically, free edge **814** includes a first outwardly angled portion **818**, a first vertical portion **820**, an inwardly angled portion **822**, a second vertical portion **824**, a horizontal portion **826**, a third vertical portion **828**, and a second outwardly angled portion **830**. First vertical portion **820** is separated from fourth vertical portion **784** of second bottom side panel **764** by a cut line **832**. Outwardly angled portions **818** and **830** are configured based on angles of fourth corner wall **860** and first corner wall **854**, respectively. First outwardly angled portion **818**, first vertical portion **820**, and inwardly angled portion **822** define a fourth corner projection **834**. Second locking extension **816** is defined by second vertical portion **824**, horizontal portion **826**, and third vertical portion **828**.

In the exemplary embodiment, a bottom locking mechanism **836** includes locking tab **738**, locking slot **768**, and locking extensions **792** and **816**. Alternatively, bottom locking mechanism **836** can include any suitable components and/or configuration that enables container **850** to be formed from blank **700**.

Referring to FIGS. **14-17**, to construct container **850** from blank **700**, first corner panel **702** is rotated about fold line **720** toward interior surface **102** of first side panel **704**, first side panel **704** is rotated about fold line **722** toward interior surface **102** of second corner panel **706**, second corner panel **706** is rotated about fold line **724** toward interior surface **102** of first end panel **708**, first end panel **708** is rotated about fold line **726** toward interior surface **102** of third corner panel **710**, third corner panel **710** is rotated about fold line **728** toward interior surface **102** of second side panel **712**, second side panel **712** is rotated about fold line **730** toward interior surface **102** of fourth corner panel **714**, fourth corner panel **714** is rotated about fold line **732** toward interior surface **102** of second end panel **716**, and glue flap **718** is rotated about fold line **734** toward interior surface **102** of second end panel **716**. In the exemplary embodiment, after rotating panels **702**, **704**, **706**, **708**, **710**, **712**, **714**, and **716** and glue flap **718** about fold lines **720**, **722**, **724**, **726**, **728**, **730**, **732**, and **734**, side panels **704** and **712** are substantially parallel to each other and substantially perpendicular to end panels **708** and **716**, and first corner panel **702**, glue flap **718**, and third corner panel **710** are substantially parallel to each other and substantially perpendicular to second corner panel **706** and fourth corner panel **714**. Panels **702**, **704**, **706**, **708**, **710**, **712**, **714**, and **716** and glue flap **718** can be rotated about fold lines **720**, **722**, **724**, **726**, **728**, **730**, **732**, and **734** by wrapping blank **700** about a mandrel within a machine. Alternatively, a folder/glue machine can be used to convey blank **700** through folder arms and adhesive applicator to form a knocked-down flat container.

Once panels **702**, **704**, **706**, **708**, **710**, **712**, **714**, and **716** and glue flap **718** are rotated about fold lines **720**, **722**, **724**, **726**, **728**, **730**, **732**, and **734**, glue flap **718** is coupled to first corner panel **702**. For example, in the exemplary embodiment, interior surface **102** of glue flap **718** is adhered to exterior surface **104** of first corner panel **702**. Alternatively, exterior surface **104** of glue flap **718** is adhered to interior surface **102** of first corner panel **702**. Further, although adhesive is described herein, glue flap **718** can be coupled to first corner panel **702** used any suitable fastener and/or technique. In the exemplary embodiment, once glue flap **718** is coupled to first corner panel **702**, first side panel **704** forms a first side wall **862** of container **850**, and second side panel **712** forms a second side wall **864** of container **850**. From this configuration, partially formed container **850** can be collapsed into a knocked-down flat configuration for shipping and/or storage of container **850**.

To continue construction of container **850**, second bottom side panel **764** is rotated about fold line **160** toward interior surface **102** of second side panel **712** to be substantially perpendicular to second side panel **712**. First bottom end panel **788** is rotated about fold line **180** toward interior surface **102** of first end panel **708** and into face-to-face relationship with second bottom side panel **764**. Similarly, second bottom end panel **812** is rotated about fold line **236** toward interior surface **102** of second end panel **716** and into face-to-face relationship with second bottom side panel **764**. More specifically, interior surface **102** of bottom end panels **788** and **812** is directly adjacent to and/or in direct contact with exterior surface **104** of second bottom side panel **764**. Locking slot **768** is further defined by locking extensions **792** and **816**.

First bottom side panel **736** is then rotated about fold line **136** toward interior surface **102** of first side panel **704**. First bottom side panel **736** is rotated toward second bottom side panel **764** and bottom end panels **788** and **812** until panels **736**, **764**, **788**, and **812** are rotated slightly upwardly. More specifically, panels **736**, **764**, **788**, and **812** are rotated such that locking tab **738** can be inserted into locking slot **768**. Once locking tab **738** is inserted into locking slot **768**, panels

736, 764, 788, and 812 rotate outwardly to be substantially perpendicular to panels 702, 704, 706, 708, 710, 712, 714, and 716 and glue flap 718. When bottom panels 736, 764, 788, and 812 are in the substantially perpendicular configuration, bottom panels 736, 764, 788, and 812 are locked together to form a bottom wall 866 of container 850. As such, bottom locking mechanism 836 interlocks bottom side panels 736 and 764 and bottom end panels 788 and 812 to form bottom wall 866 of container 850, as shown in FIG. 17.

First corner post panel 184 is rotated about fold line 188 toward exterior surface 104 of first reinforcing end panel 168, and second corner post panel 186 is rotated about fold line 190 toward exterior surface 104 of first reinforcing end panel 168. In the exemplary embodiment, after rotation about fold lines 188 and 190, exterior surface 104 of corner post panels 184 and 186 are oriented at approximately 135° with respect to exterior surface 104 of first reinforcing end panel 168. Alternatively, exterior surface 104 of corner post panels 184 and/or 186 can be oriented at any suitable angled with respect to exterior surface 104 of first reinforcing end panel 168. In the exemplary embodiment, first reinforcing end panel 168 is rotated about double fold lines 174 and 176 toward interior surface 102 of first end panel 708. As first reinforcing end panel 168 is rotated, first top end panel 170 remains substantially planar with first end panel 708. First reinforcing end panel 168 is rotated into face-to-face relationship with first end panel 708. More specifically, interior surface 102 of first reinforcing end panel 168 is directly adjacent to and/or in direct contact with interior surface 102 of first end panel 708. First reinforcing end panel 168 and first end panel 708 define a first end wall 868.

Further, first corner post panel 184 is rotated into face-to-face relationship with second corner panel 706, and second corner post panel 186 is rotated into face-to-face relationship with third corner panel 710. First corner post panel 184 and second corner panel 706 define second corner wall 856, and second corner post panel 186 and third corner panel 710 define third corner wall 858.

Third corner post panel 238 is rotated about fold line 242 toward exterior surface 104 of second reinforcing end panel 224, and fourth corner post panel 240 is rotated about fold line 244 toward exterior surface 104 of second reinforcing end panel 224. In the exemplary embodiment, after rotation about fold lines 242 and 244, exterior surface 104 of corner post panels 238 and 240 is oriented at approximately 135° with respect to exterior surface 104 of second reinforcing end panel 224. Alternatively, exterior surface 104 corner post panels 238 and/or 240 can be oriented at any suitable angled with respect to exterior surface 104 of second reinforcing end panel 224. In the exemplary embodiment, second reinforcing end panel 224 is rotated about double fold lines 230 and 232 toward interior surface 102 of second end panel 716. As second reinforcing end panel 224 is rotated, second top end panel 226 remains substantially planar with second end panel 716. Second reinforcing end panel 224 is rotated into face-to-face relationship with second end panel 716. More specifically, interior surface 102 of second reinforcing end panel 224 is directly adjacent to and/or in direct contact with interior surface 102 of second end panel 716. Second reinforcing end panel 224 and second end panel 716 define a second end wall 870.

Further, third corner post panel 238 is rotated into face-to-face relationship with fourth corner panel 714, and fourth corner post panel 240 is rotated into face-to-face relationship with first corner panel 702 and/or glue flap 718. Third corner post panel 238 and fourth corner panel 714 define fourth corner wall 860, and fourth corner post panel 240, first corner panel 702, and glue flap 718 define first corner wall 854. Corner walls 854, 856, 858, and 860, side walls 862 and 864, end walls 868 and 870, and bottom wall 866 define a cavity 872 of container 850. When corner walls 854, 856, 858, and 860, side walls 862 and 864, end walls 868 and 870, and bottom wall 866, container 850 is considered to be in an open configuration, as shown in FIG. 15. To close container 850, top wall 852 is formed similarly to top wall 452 (shown in FIGS. 6 and 7) of container 450, as shown in FIG. 16.

The above-described embodiments provide reinforced containers for shipping and/or storing products in a stacked configuration. More specifically, because the end walls are reinforced and the containers described herein include corner posts, the above-described containers can be stacked without the containers substantially deforming from compression forces applied by upper containers. Further, the embodiments described herein provide a single blank of sheet material for forming a reinforced container. As such, no additionally inserts are needed to provide the reinforcement to the container. Rather, the corner posts are integrally formed with a reinforcing end panel. Additionally, the above-described alignment panel facilitates automated construction of containers from the blanks by enabling a machine to properly align the blanks. Moreover, the embodiments including the alignment panel can be used with known taping machines because the top side panels do not overlap.

Exemplary embodiments of blanks and methods for forming reinforced containers are described above in detail. The apparatus and methods are not limited to the specific embodiments described herein, but rather, components of apparatus and/or steps of the methods may be utilized independently and separately from other components and/or steps described herein. For example, the methods may also be used in combination with other reinforced containers and methods, and are not limited to practice with only the reinforced containers and methods as described herein. Rather, the exemplary embodiment can be implemented and utilized in connection with many other container applications.

Although specific features of various embodiments of the invention may be shown in some drawings and not in others, this is for convenience only. In accordance with the principles of the invention, any feature of a drawing may be referenced and/or claimed in combination with any feature of any other drawing.

This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

What is claimed is:

1. A blank of sheet material for forming a container, the blank comprising:

a series of side and end panels connected by a plurality of fold lines, the series of panels comprising a first end panel;

a first reinforcing end panel extending from the first end panel;

a first corner post panel extending from a first edge of the first reinforcing end panel; and

a first top end panel defined within the first reinforcing end panel and extending from the first end panel.

2. A blank of sheet material in accordance with claim **1** further comprising a second corner post panel extending from a second edge of the first reinforcing end panel, the second edge opposing the first edge.

3. A blank of sheet material in accordance with claim **1** further comprising a first side reinforcing panel extending from an edge of the first corner post panel.

4. A blank of sheet material in accordance with claim **1** further comprising a second reinforcing end panel extending from a second end panel of the series of panels.

5. A blank of sheet material in accordance with claim **4** further comprising a third corner post panel extending from a first edge of the second reinforcing panel and a fourth corner post panel extending from a second, opposing edge of the second reinforcing end panel.

6. A blank of sheet material in accordance with claim **5** further comprising a second side reinforcing panel extending from an edge of one of the third corner post panel and the fourth corner post panel.

7. A blank of sheet material in accordance with claim **1**, wherein the first top end panel comprises a locking mechanism.

8. A blank of sheet material in accordance with claim **7** further comprising:

a first top side panel extending from a first side panel, the first top side panel comprising a cutout; and

a second top side panel extending from a second side panel, the second top side panel comprising a locking flap, the locking mechanism configured to be inserted through the cutout and secured in position by the locking flap.

9. A blank of sheet material in accordance with claim **1** further comprising:

a first bottom end panel extending from the first end panel, the first bottom end panel comprising a first locking extension;

a second bottom end panel extending from a second end panel of the series of panels, the second bottom end panel comprising a second locking extension; and

a first bottom side panel extending from a first side panel of the series of panels, the first bottom side panel comprising a locking slot formed in cooperation with the first locking extension and the second locking extension.

10. A blank of sheet material in accordance with claim **9** further comprising a second bottom side panel extending from a second side panel of the series of panels, the second bottom side panel comprising a locking tab configured to be received in the locking slot.

11. A container formed from a blank of sheet material, the container comprising:

a first end wall formed from a first end panel and an interconnected first reinforcing end panel positioned in face-to-face relationship with the first end panel;

a first top end panel extending from the first end panel; and

a bottom wall oriented substantially perpendicularly to the first end wall, the bottom wall comprising a plurality of bottom panels interlocked together using a bottom locking mechanism, said bottom locking mechanism comprising a locking slot defined by three bottom panels of the plurality of bottom panels and a locking tab defined by one bottom panel of the plurality of bottom panels, the locking tab received within the locking slot to form the bottom wall.

12. A container in accordance with claim **11** wherein the container is four-sided.

13. A container in accordance with claim **12** further comprising a first side wall, an opposing second side wall, a second end wall opposing the first end wall, and at least one corner post extending between at least one of the first side wall and the first end wall, the first side wall and the second end wall, the second side wall and the first end wall, and the second side wall and the second end wall.

14. A container in accordance with claim **13**, wherein at least one of the first side wall and the second side wall comprising a side reinforcing panel.

15. A container in accordance with claim **11** wherein the container is eight-sided.

16. A container in accordance with claim **15**, wherein the container comprises a plurality of corner walls, at least one corner wall of the plurality of corner walls comprising a corner panel and a corner post panel.

17. A container in accordance with claim **11** further comprising a top wall comprising a first top side panel, a second top side panel, the first top end panel, and a second top end panel.

18. A container in accordance with claim **17**, wherein

the first top side panel comprises a first locking cutout and a second locking cutout;

the second top side panel comprises a first locking flap and a second locking flap, a minor cutout is defined adjacent to each of the locking flaps; and

each top end panel comprises a locking mechanism configured to be received in a minor cutout and one of the first locking cutout and the second locking cutout and secured by one of the first locking flap and the second locking flap to form the top wall.

19. A method for forming a container from a blank of sheet material, the blank including a series of side and end panels connected by a plurality of fold lines, at least one reinforcing end panel connected to at least one panel of the series of panels, at least one corner post panel extending from the at least one reinforcing end panel, and an upper end panel extending from the at least one panel of the series of panels, the method comprising:

rotating the series of panels about the plurality of fold lines to form at least a portion of a first side wall, an opposing second side wall, a first end wall, and an opposing second end wall;

rotating the at least one reinforcing end panel with respect to at least one of the first end wall and the second end wall and the upper end panel extending from the at least one of the first end wall and the second end wall to form a portion of the at least one of the first end wall and the second end wall; and

rotating the at least one corner post panel with respect to the at least one reinforcing end panel to form at least one corner post within the container.

20. A method in accordance with claim **19** further comprising forming a bottom wall by interlocking a plurality of bottom panels together.

21. A method in accordance with claim **20** wherein forming a bottom wall comprises inserting a locking tab into a locking slot, the locking tab and the locking slot defined by a plurality of bottom panels.

22. A method in accordance with claim **19** further comprising:

rotating a plurality of top panels with respect to the series of panels; and

interlocking the plurality of top panels together using locking cutouts, locking tabs, minor cutouts, and locking slots defined by the plurality of top panels.

23. A locking mechanism for use with a container formed from a blank of sheet material, the blank including a first top panel, a second top panel, a third top panel, and a fourth top panel, the locking mechanism comprising:

a first locking cutout and a second locking cutout defined in the first top panel;

a first locking flap and a second locking flap defined by the second top panel;

a first minor cutout adjacent the first locking flap and a second minor cutout adjacent the second locking flap, wherein the first and second minor cutouts are defined through the second top panel; and

a first locking tab defined by the third top panel and a second locking tab defined by the fourth top panel, the first locking tab configured to be inserted through the first locking cutout and the first minor cutout and secured in position by the first locking flap, and the second locking tab configured to be inserted through the second locking cutout and the second minor cutout and secured in position by the second locking flap.

24. A locking mechanism in accordance with claim **23**, wherein the first and second locking tabs each comprise:

an upper support panel configured to extend below the first top panel between a top edge of an end panel and the at least one cutout;

a center portion extending from the top support panel; and

a pair of side flaps each extending from a side edge of the center portion, the side flaps configured to engage the second top panel adjacent the first and second locking flaps when the first and second locking tabs are interlocked with the first and second cutouts and the first and second locking flaps.

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